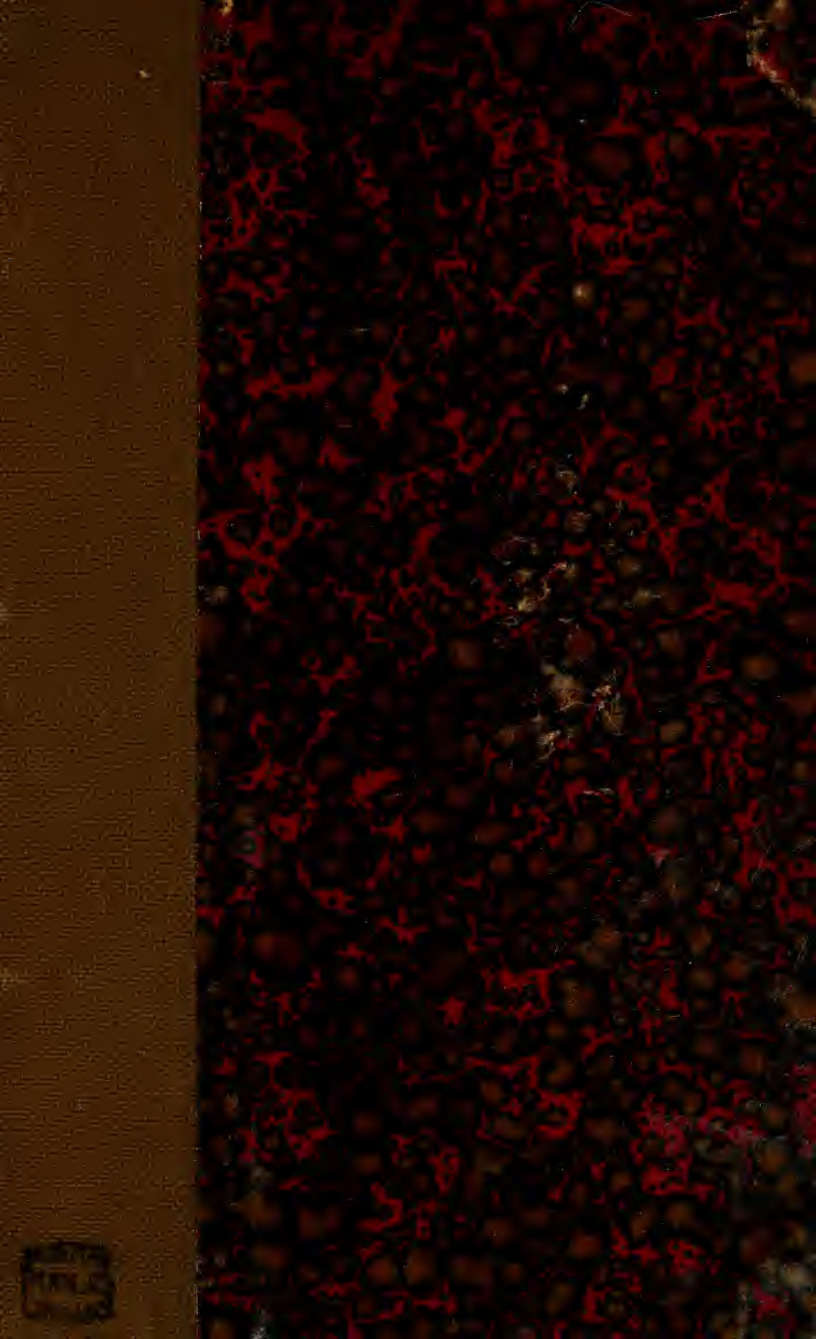




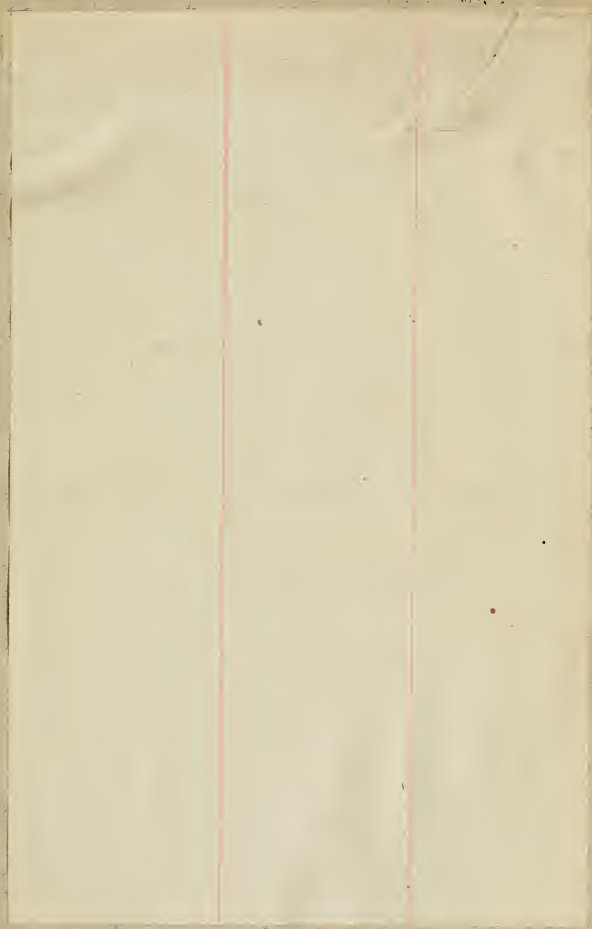
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PHYSIOLOGY

FOR

CHILDREN.

By CALVIN CUTTER, M. D.

AUTHOR OF ANATOMY AND PHYSIOLOGY FOR ACADEMIES, ETC., AND
PHYSIOLOGY FOR COMMON SCHOOLS.

WITH

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P R E F A C E .

IN presenting this work to the public, the author would indulge in a few prefatory suggestions.

Education, to be complete, must be not only moral and intellectual, but physical. As the culture of the mind and of the affections is the subject of systematic attention in early life, should not the education of the physical powers be commenced as early? It will demand no more maturity and thought to understand the reasons for adequate clothing, bathing, the necessity of an erect position in standing and sitting, regularity in taking food, the supply of pure air to the lungs, &c., than to comprehend geographical details or moral truths. Is not a knowledge of the laws and habits upon which health depends, as important to the development of a vigorous physical constitution, as moral instruction is to the formation of correct moral principles? Can any reason be given why both should not be taught in the school-room? 2012

A child should be taught to call each organ by its correct name. No more effort is required to learn the meaning of a *proper*, than an improper term. For example: a

child will pronounce the word as readily, and obtain as correct an idea, if you say *lungs*, as if you used the word *lights*.

In preparing this work, it has not been deemed necessary to use low, vulgar terms, for the purpose of being understood; but such words have been selected, as good usage sanctions. Should the pupil meet with any word he does not understand, let him consult his dictionary, as he should do in perusing works upon history, when a similar difficulty occurs.

An ample glossary of technical terms has been appended to the work, to which reference should be made. This is particularly important, as the accented syllable is marked, which will aid in acquiring a correct pronunciation of these words.

For a more full and complete explanation of Anatomy and Physiology, the pupil is referred to the author's Treatise of 220 pages, for Common Schools, or to his still more copious work of 340 pages, for Academies, High Schools, and Families.

To the instructors of youth, and the patrons of education, this work is respectfully submitted.

CONTENTS.

A.	Page.	C.	Page.
Abdomen, ...	30	Capillaries, ...	35, 49
Absorbents, ...	66	Carbonic Acid Gas, ...	36
Air, consists of, ...	37	Cartilage, ...	14
" effects of breathing impure, ..	36	Cerebellum, ...	56
" effects on sound, ...	39	Cerebrum, ...	56
Air-cells, ...	34, 37	Chest, form of, ...	9
Aorta, ...	48	" contracted, ...	37
Arteries, ...	46	Choroid coat, ...	86
" method of compressing, ..	52	Chyle, ...	27
Attitudes, ...	21, 40	Chyme, ...	26
Auricle, ...	45	Clothing, kind of, ...	73
		" change of, ...	73
		Cochlea, ...	82
		Cornea, ...	86
B. Bathing, necessity of, ...	72	Cuticle, use of, ...	66
" method of, ...	72	" how formed, ...	66
" proper time for, ...	72	" colored layer of, ...	68
Bile, ...	28	Cutis Vera, ...	68
Blood, circulation of, ...	45		
" change of, ...	35		
" composition of, ...	43		
" quantity in the system, ..	50	D. Deafness, cause of, ...	85
" how made impure, ...	36	Digestive Organs, ...	23
Bones of the head, ...	8	" structure of, ...	23
" of the trunk, ...	9	" how impaired, ...	29-31
" of the lower extremities, ..	12	Drink, ...	29
" of the upper extremities, ..	12	Drowned, treatment of persons, ..	38
" of the ear, ...	81	Duodenum, ...	27
" composition of, ...	13		
" use of, ...	8		
Brain, ...	56	E. Ear, anatomy of, ...	80
" membranes of, ...	56	" the external, ...	81
" its function, ...	56	" the middle, ...	81
" effect of continued mental		" the internal, ...	81
exertion, ...	62	Eustachian Tube, ...	81
" consequence of inactivity, ..	62	Eye, form of, ...	85
" injuries of, ...	63	" coats of, ...	85
Burns, ...	74	" humors of, eyebrows, &c., ..	90

F.		O.	
	Page.		Page.
Face, bones of, ...	9	Œsophagus, ...	25
Flannel, ...	73	Oil-glands, ...	67
Food, quantity of, ...	28	Optic nerve, ...	87
“ quality of, ...	29		
“ should be taken at stated periods, ...	29	P.	
Freezing, ...	73	Papillæ, ...	69
		Perspiratory Gland, ...	69
G.		“ “ function of, ..	69
Gastric Juice, ...	25	“ effects of inactivity of, ..	71
Glands, lachrymal, ...	90	Pharynx, ...	78
“ mesenteric, ...	27	Poisons, and their antidotes, ...	95
“ oil, ...	67		
“ perspiratory, ...	69	R.	
“ salivary, ...	25	Removal of disease, ...	91
		Respiratory organs, ...	32
H.		Retina, ...	87
Heart, anatomy of, ...	45	Ribs, ...	10
Hearing, sense of, ...	80		
Hemorrhage, means of arresting, ..	52	S.	
Humors of the eye, ...	87	Saliva, its use, ...	23
		Scalds, ...	74
I, J.		Sclerotic coat, ...	86
Iris, ...	86	Senses, ...	76
Joints, ...	14	Sitting, proper position in, ...	21
		Skeleton, ...	15
L.		Skin, ...	66
Labyrinth, ...	81	Smell, sense of, ...	77
Lacteals, ...	28	Sound, ...	83
Larynx, anatomy of, ...	39	Spinal column, ...	10
Ligaments, ...	14	“ cord, ...	61
Liver, ...	24	Strabismus, ...	90
Lungs, anatomy of, ...	32		
“ necessity of ample volume, ..	37	T.	
“ air in the, ...	38	Taste, sense of, ...	76
		Tendon, ...	17
M.		Thoracic Duct, ...	28
Medulla Oblongata, ...	57	Thorax, ...	32
Mineral Poisons, ...	96	Tricuspid Valves, ...	45
Muscles, anatomy of, ...	16	Tympanum, ...	81
“ physiology of, ...	17		
“ compression of, ...	19	V.	
“ over exertion of, ...	20	Veins, ...	49
“ effect of inactivity of, ..	21	Vegetable Poisons, ...	49
Mitral Valves, ...	45	Ventilation, ...	40
		Ventricles of the heart, ...	45
N.		Vertebræ, ...	10
Nasal, fossæ, ...	78	Vestibule, ...	81
Nerves, cranial, ...	58	Vision, ...	85
“ function of, ...	58	Voice, where formed, ...	39
“ spinal, ...	59	Vocal Cords, ...	39
“ function of, ...	60		

PHYSIOLOGY FOR CHILDREN.

CHAPTER I.

THE BONES.

Mrs. G. As you have acquired some idea of geography, or a description of the different parts of the world, I now propose to give you an account of the different organs or parts of the human body. The science of the number, shape, and structure of the organs, we call ANATOMY. A knowledge of the functions, or use of organs, we call PHYSIOLOGY. I shall first tell you about the BONES of the body.

Ida. Where are the bones found?

Mrs. G. They are the frame of the body, having outside of them the flesh and skin.

Ida. How many bones are there in the body?

Mrs. G. About two hundred and forty-four.

Ida. What is their use?

Mrs. G. To support other parts of the body not as hard or firm as they are, and also to give protection to some organs, as the brain.

Ida. Have the bones other uses?

Mrs. G. They have. Some are employed in cer-

tain movements, while they give protection to organs which they surround, as the ribs; others only aid in the different movements of the body, as the bones of the extremities, or the bones of the arm or leg.

Fig. 1.

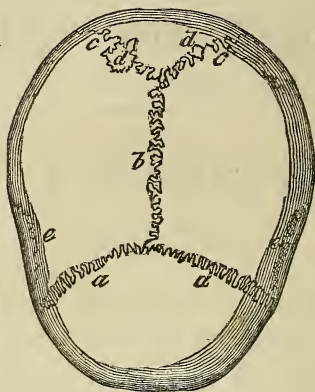


Fig. 1. *a, a*, The coronal suture at the front and upper part of the head; *b*, the sagittal suture, that lies upon the top of the head; *c, c*, the lambdoidal suture at the back part of the head; *d, d*, the *ossa triquetra*, small ragged bones, occasionally found in some skulls, lying in the last-mentioned suture; *e, e*, parts of the temporal bone.

Ida. How many pieces of bone are there in the skull?

Mrs. G. Eight pieces; the union of their ragged edges is called a *suture*.

Ida. Are the skull bones the same in form as the other bones?

Mrs. G. They are not; while the bones of the skull are flat, those of the extremities are round; while the skull bones are composed of two thin pieces of dense, bony matter, united by a spongy portion of bone, those of the extremities are hollow, and filled with a fatty matter, called marrow.

Ida. How many bones are there in the face?

Mrs. G. Fourteen: besides these, there are thirty-two teeth, four small bones in each ear, and one at the root of the tongue.

Fig. 2.

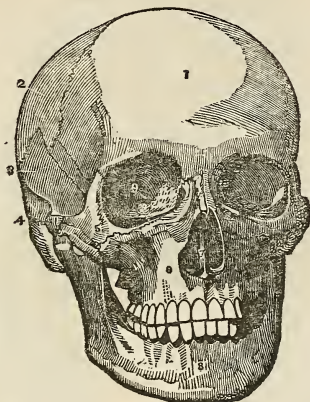


Fig. 2. 1, Bone of the forehead, called the frontal. 2, The parietal bone. 3, The temporal bone. 4, The zygomatic process of the temporal bone. 5, The malar or cheek bone. 6, The upper jaw bone. 7, The vomer that separates the cavities of the nose. 8, The lower jaw. 9, The cavity for the eye.

Ida. How many ribs have we?

Mrs. G. Twenty-four; twelve on each side.

Ida. You said the ribs protected some organs, and were employed in certain movements. What organs do they surround?

Mrs. G. The lungs and heart; and, by looking at fig. 3, you will see that they are adapted to both the purposes that I have previously mentioned.

Ida. What does fig. 3 represent?

Mrs. G. The natural form of the chest. You will observe that the lower part of the chest is broader and fuller than the upper part. This is true of the chest of girls, as well as boys.

Fig. 3.

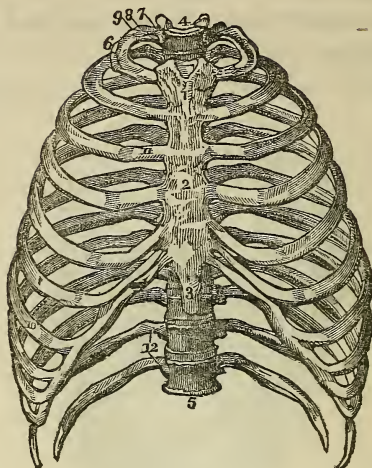


Fig. 3. 1, The first bone of the sternum. 2, The second bone of the sternum. 3, The ensiform cartilage of the sternum. 4, The first dorsal vertebra. 5, The last dorsal vertebra. 6, The first rib. 7, Its head. 8, Its neck. 9, Its tubercle. 10, The seventh, or last true rib. 11, The cartilage of the third rib. 12, The false, or floating ribs.

Ida. To what are the ribs united?

Mrs. G. The seven upper ribs are united in front to the *sternum*, or breast bone, through the medium of cartilages. The five lower ones are not attached to the sternum. All the ribs are connected with the *spinal* column, or back bone.

Ida. Of how many bones is the spinal column composed?

Mrs. G. Twenty-four, called *vertebræ*; between each *vertebra* is a gristly substance, called cartilage, which enables us to bend our bodies.

Ida. Do the twenty-four bones of the spinal column include the hip bones?

Mrs. G. They do not; the lower *vertebra* of the spinal column is connected with a three-cornered bone called the *sacrum*, which is situated between the two broad hip bones. Below the sacrum is another bone, called the *coccyx*. This is the terminal extremity of the spinal column. In the side of the hip bone is a cup-like cavity, in which the *femur* or thigh bone is placed.

Fig. 4.



Fig. 5.

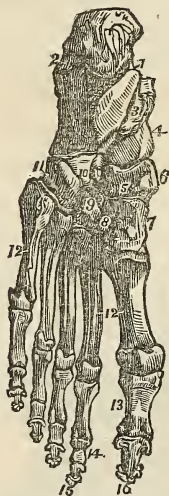


Fig. 4. A representation of the upper surface of the bones of the foot. 1, The surface of the astragalus, where it unites with the tibia. 2, The body of the astragalus. 3, The calcis, or heel bone. 4, The scaphoid bone. 5, 6, 7, The cuneiform bones. 8, The cuboid bones. 9, The range of five bones, forming the metatarsus. 10, The first bone of the great toe. 11, The second bone. 12, 13, 14, Three ranges of bones, forming the small toes.

Fig. 5. A representation of the lower surface of the bones of the foot. 1 and 2, The os calcis, or heel bone. 3, A groove for a tendon. 4, The astragalus bone. 5, The navicular bone. 6, Its inner tuberosity. 7, The internal cuneiform bone. 8, The middle cuneiform bone. 9, The external cuneiform bone. 10, The cuboid bone. 11, A groove for a tendon. 12, 12, The metatarsal bones. 13, The first range of toe bones. 14, The second range of toe bones. 15, The third range of toe bones. 16, The last bone of the great toe.

Ida. How many bones in the leg?

Mrs. G. Three; the *femur*, or thigh bone above the knee; the *tibia* and *fibula*, below the knee.

Ida. Do not figs. 4 and 5 represent the bones of the foot?

Mrs. G. They do: the foot is composed of three sets of bones; seven *tarsal*, five *metatarsal*, and fourteen toe bones.

Ida. Are the bones of the upper extremities like those of the lower?

Mrs. G. We find in the arm, as in the leg, three bones; one above the elbow, called the *humerus*, and two below, called the *radius* and *ulna*. These two bones, by their union, produce a rotary movement of the hand.

Fig. 6.

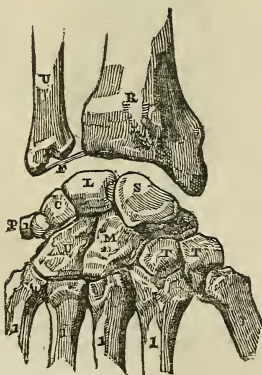


Fig. 7.

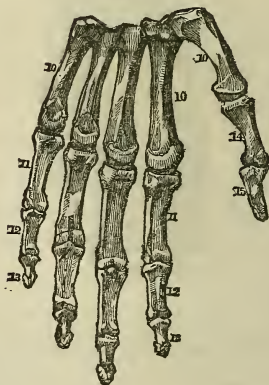


Fig. 6. *u*, The ulna; *r*, the radius; *s*, the scaphoid bone; *l*, the semi-lunar bone; *c*, the cuneiform bone; *p*, the pisiform bone. These four form the first row. *t*, *r*, The trapezium and trapezoid bones; *m*, the os magnum; *u*, the unciform bone. These four form the second row. 1, 1, 1, 1, 1, The metacarpal bones of the thumb and fingers.

Fig. 7. 10, 10, 10, The metacarpal bones of the hand. 11, 11, First range of finger bones. 12, 12, Second range of finger bones. 13, 13, Third range of finger bones. 14 and 15, First and second bones of the thumb.

Ida. Will you tell me how many bones there are in the hand?

Mrs. G. With pleasure, *Ida.* The *carpus*, or wrist, is composed of eight bones, arranged in two rows. The *metacarpus*, or palm of the hand, has five bones. The *phalanges*, or fingers, have three ranges of bones, while the thumb has but two.

Ida. What are bones made of?

Mrs. G. The bones of the human body, as well as those of the ox and sheep, are composed of *gelatin* (commonly called jelly) and lime, united with phosphoric and carbonic acid.

Fig. 8.

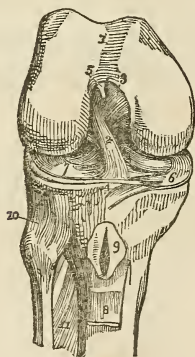


Fig. 9.

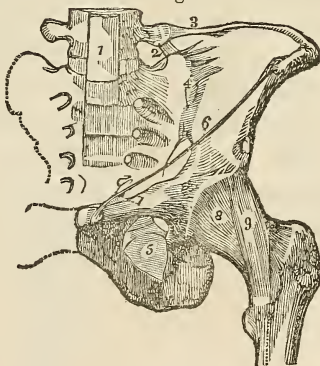


Fig. 8. The knee joint laid open. 1, The articular extremity of the thigh bone. 2, 3, The crucial ligaments of the knee. 6, 7, The semi-lunar cartilages of the knee joint. 8, The attachment of the ligament of the patella to the tibia. 9, A bursa mucosa under this ligament. 10, The ligament that binds the tibia and fibula together. 11, The interosseous ligament between the tibia and fibula.

Fig. 9. The ligaments of the pelvis and hip-joint. 1, The lower part of the anterior ligament of the vertebræ. 2, A ligament which extends from one of the vertebra to the sacrum. 3, A ligament which extends from the vertebræ to the ilium. 4, Ligaments that connect the ilium and sacrum. 5, The obturator membrane. 6, Poupart's ligament. 7, Gimbernat's ligament. 8, The capsular ligament of the hip-joint. 9, The ilio-femoral or accessory ligament.

Ida. Are the bones of the child as hard as those of the aged man?

Mrs. G. They are not. In youth, the bones contain more gelatin than the salts of lime, and consequently they will bend more readily than those of the aged man. As we become older, the salts of lime increase, which makes the bones brittle, and more liable to be broken.

Ida. Will you tell me how the *joints* are formed?

Mrs. G. There are always two or more bones that assist in forming a joint. The ends of bones are tipped with *cartilage*, (commonly called gristle.) This is covered with a thin, white skin or membrane, from which flows a fluid that moistens the joints. The whole is surrounded by strong bands, called *ligaments*.

Ida. Please explain more particularly how bones are bound together by ligaments.

Mrs. G. These satin-like bands pass from the prominent points of one bone to the projecting points of another, and they are so strong and inelastic that it is difficult to tear apart bones thus united.

Fig. 10.

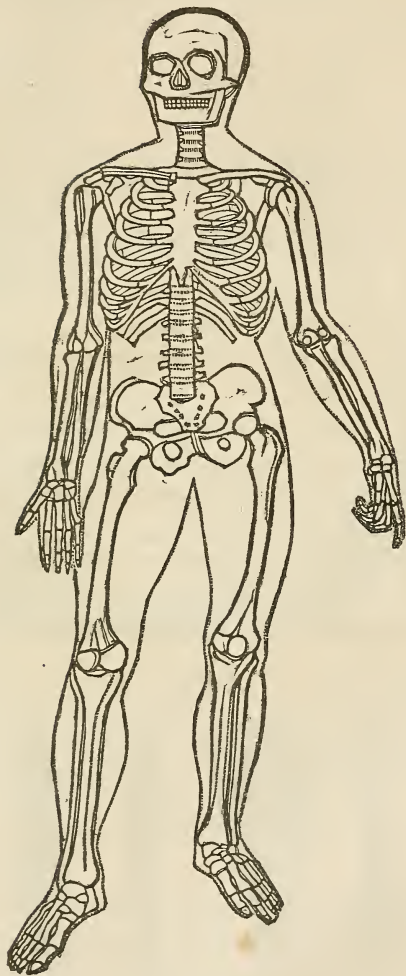


Fig. 10 gives a fine view of a perfect skeleton, with the outlines of the soft tissues surrounding the bones, and shows the relations of each.

CHAPTER II.

THE MUSCULAR SYSTEM.

Mrs. G. To-day, Ida, I shall tell you about the MUSCLES, or lean meat of the body.

Ida. Pray tell me, if the lean meat or flesh of the body is called muscle.

Mrs. G. Yes; and when we examine a piece of flesh, we find it composed of many minute threads, called *fibres*, which unite at each extremity, forming a glistening cord, called *tendon*.

Ida. Do these fibres run in straight lines?

Mrs. G. Some do, and others spread out like a fan; in some instances, they are arranged like the plumes of a pen.

Fig. 11.

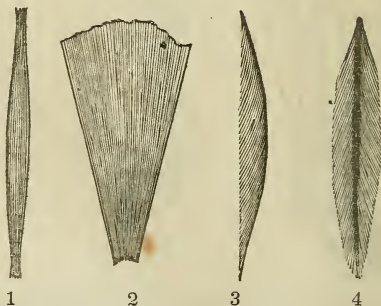


Fig. 11. 1, represents the direction and arrangement of the fibres in a spindle-shaped muscle; 2, in a radiated, or fan-like muscle; 3, in a penniform muscle; 4, in a bipenniform muscle.

Ida. Of what use are the tendons?

Mrs. G. They tie the muscle to the surface of the bone.

Ida. What is the use or peculiar property of muscle?

Mrs. G. The peculiar property of muscular fibre is its power to contract or shorten, so as to bring the ends of the muscle nearer together. This shortening produces the varied movements of the bones, as seen in bending the elbow.

Fig. 12.

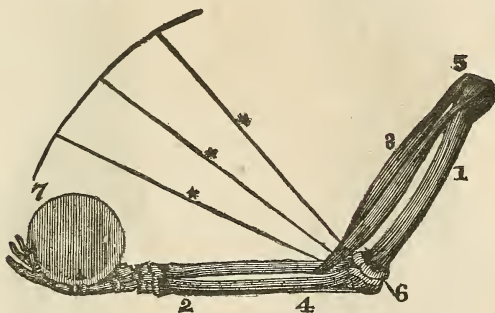


Fig. 12. 1, The humerus, or first bone of the arm. 2, One of the bones of the fore-arm, to which the muscle (3,) that bends the elbow, is attached at 4. 5, The attachment of this muscle to the humerus, at its upper extremity. 6, The elbow joint. 7, A weight in the hand, to be elevated by the contraction of the muscle seen at 3; as the bones of the fore-arm (2,) are brought to the lines indicated by ***, the belly of the muscle (3,) contracts, and its two ends are brought nearer together.

Ida. Is there more than one layer of muscle over the bones?

Mrs. G. In some parts of the body there is but one, in other parts we find five or six layers, placed over each other. When there are several layers over the bone, the upper ones are called the superficial muscles; the lower ones, the deep-seated.

Fig. 13.

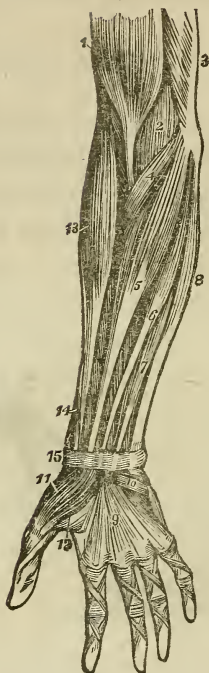


Fig. 14.

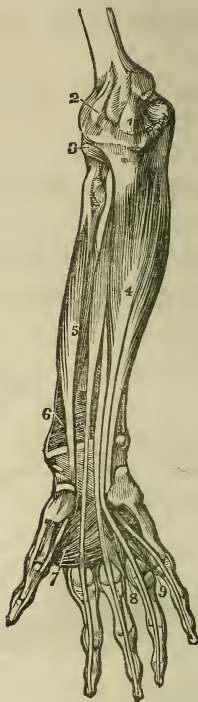


Fig. 13 represents the superficial layer of muscles on the anterior aspect of the fore-arm.

The muscles 1, 2, bend the arm at the elbow. The muscle 3 extends the arm at the elbow. The muscle 4 turns the palm of the hand down. The muscles 5, 6, and 8, bend the wrist on the bones of the fore-arm. The muscle 7 bends the second range of finger-bones on the first. The muscle 11 draws the thumb from the fingers. The muscle 12 flexes the thumb. The muscle 13 turns the palm of the hand upward. The muscles 8, 13, and 14, move the hand laterally.

Fig. 14 represents the deep layer of muscles on the anterior aspect of the fore-arm.

The muscle 4 bends the last range of finger-bones upon the second. The muscle 5 bends the last joint of the thumb. The muscle 6 turns the back of the hand up. The muscle 7 draws the thumb towards the hand. The muscles 8 and 9 draw the bones of the hand and fingers towards each other.

Ida. How many muscles in the human body?

Mrs. G. Anatomists do not agree upon the exact number; some dividing into two muscles what others describe as one. They are generally estimated at four hundred and fifty.

Ida. Can the muscles be injured as well as the bones?

Mrs. G. They can, by compression and long-continued use.

Ida. Tight dressing, then, is injurious to the muscles?

Mrs. G. Yes, very injurious; it prevents their growth, and consequently, enfeebles their action.

Fig. 15.

Fig. 16.



Fig. 15. The stooping and deformed position is illustrated. This deformity can be corrected, if the youth will frequently practise throwing the shoulders back, and walk, as well as stand erect. Pupils, while standing during recitations, often inadvertently assume the leaning attitude, and it is the duty of teachers to correct this position when assumed.

Fig. 16. The erect and correct position for standing is represented.

Every article of clothing should be worn loosely, that the muscles may attain a proper size, and act without impediment.

Ida. Tell me in what instances muscles are injured, by using them too long a time.

Mrs. G. It is a law of the muscles, that they should be used with alternate rest. A familiar instance of over-action of the muscles is noticed in shopping; the pain felt indicates muscular exhaustion. If we stoop in walking, we are more fatigued than if we walked erect.

Ida. Can we walk farther when our bodies and heads are erect, than when we incline them forward?

Mrs. G. Certainly; because a less number of muscles are called into action, and more of the influence sent from the brain to the muscular system is expended upon those muscles necessary for movement.

Fig. 17.



Fig. 17 represents a very injurious position, while sitting.

Ida. Then, is it injurious to incline forward, when we stand ?

Mrs. G. There are two reasons why it is injurious to stoop in standing or sitting. 1st. When we bend forward in standing, and more particularly in sitting, the lungs and digestive organs are restricted in their movements ; this diminishes their functional activity. 2d. The muscles of the back are kept in a state of tension or stretch, which exhausts the nervous system.

Fig. 18.



Fig. 18 represents the proper and physiological position in sitting.

Ida. What is the effect if we do not use our muscles ?

Mrs. G. Their contractile power is enfeebled, and they diminish in size. For this reason, every muscle of the system should be regularly used ; not only the health and strength of the muscles, but that of other organs, is dependent upon the exercise of the muscular system.

Fig. 19.

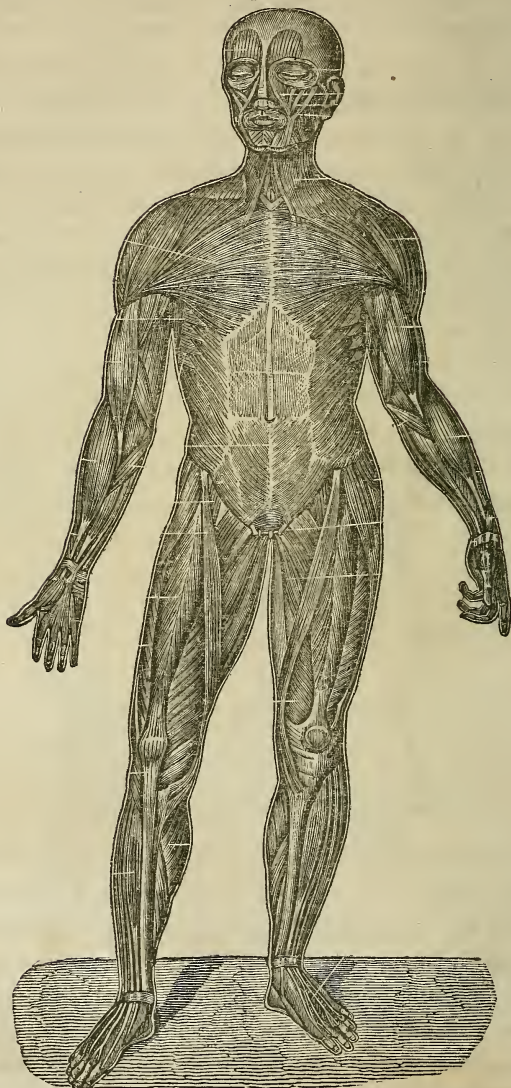


Fig. 19 represents a front view of the superficial muscles.

CHAPTER III.

DIGESTIVE ORGANS.

Mrs. G. I will now tell you about the DIGESTIVE ORGANS, or those parts that aid in preparing the food which we eat, for nourishing the body.

Ida. What organs aid in digestion?

Mrs. G. The *mouth* and its appendages, the *æso-phagus*, *stomach*, *liver*, *pancreas*, small and large *intestines*, *lacteals*, and *thoracic duct*.

Ida. What is the general structure of these organs?

Mrs. G. The *æso-phagus*, or gullet, the stomach, small and large intestines, lacteals, and thoracic duct, are hollow, and have coats, or walls, which are highly distensible; the liver and pancreas are solid organs.

Ida. Will you explain how the different organs, represented in Fig. 20, prepare the food to nourish the body?

Mrs. G. Certainly. The food, while in the mouth, becomes moistened by a fluid called *saliva*, which is separated from the blood by the action of the *salivary* glands. This fluid, combined with the action of the teeth, prepares the food for the stomach.

Fig. 20.

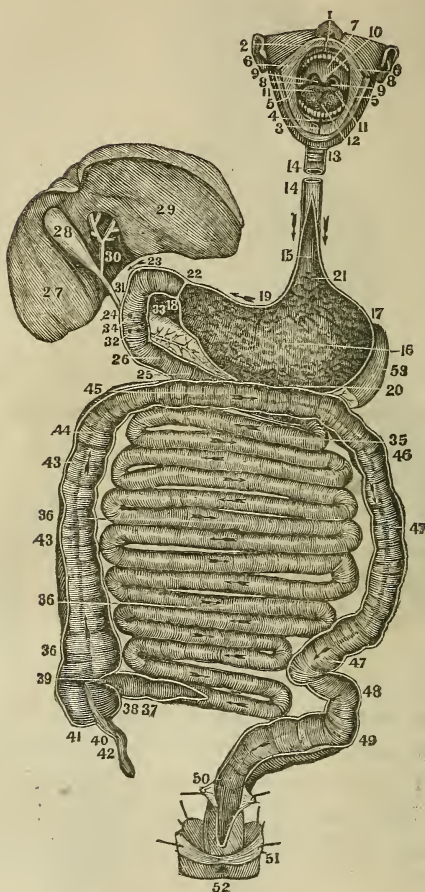


Fig. 20. A view of the organs of digestion, opened nearly their whole length. A portion of the œsophagus has been removed. The arrows indicate the course of substances along the canal. 1, The upper lip, turned off the mouth. 2, Its frænum. 3, The under lip, turned down. 4, Its frænum. 5, 5, The inside of the cheeks. 6, 6, Point to the opening of the duct of Steno. 7, The roof of the mouth. 8, 8, The lateral half arches. 9, 9, Point to the tonsils. 10, The velum palati. 11, 11, The surface of the tongue. 12, Papillæ near its point. 13, A portion of the

trachea. 14, 14, The œsophagus. 15, Its internal surface. 16. The inside of the stomach. 17, Its greater extremity. 18, Its lesser extremity. 19, Its lesser curvature. 20, Its greater curvature. 21, The cardiac orifice. 22, The pyloric orifice. 23, The upper portion of the duodenum. 24, 25, The remainder of the duodenum. 26, Its valvulæ conniventes. 27, 29, The liver. 28, The gall bladder. 30, The hepatic duct. 31, The ductus communis choledochus. 32, Its opening into the duodenum. 33, The pancreas. 34, Its opening into the duodenum. 35, The upper part of the jejunum. 36, 36, 36, The ileum. 37, Some of its valvulæ conniventes. 38, The lower extremity of the ileum. 39, The ileo-colic valve. 41, The cæcum or caput coli. 42, The vermiform appendage. 43, 44, The ascending colon. 45, The transverse colon. 46, 47, 47, The descending colon. 48, The sigmoid flexure of the colon. 49, The upper portion of the rectum. 50, Its extremity. 51, A portion of the levator ani muscle. 52, The anus. 53, The spleen.

Fig. 21.



Fig. 21. A view of the salivary glands, in their proper situations. 1, The parotid gland. 2, The duct of Steno. 3, The submaxillary gland. 4, Its duct. 5, The sublingual gland brought to view, by the removal of a section of the lower jaw.

Ida. The œsophagus, then, may be considered as a canal, for the conveyance of food and drink to the stomach.

Mrs. G. This is its principal use. By the action of the coats of the stomach, and a fluid called

gastric juice, the various kinds of food is changed into a substance which is named *chyme*.

Ida. By what parts is the gastric juice prepared?

Mrs. G. It is separated from the blood, by the action of very minute glands, that lie under the *mucus*, or internal coat of the stomach.

Fig. 22.

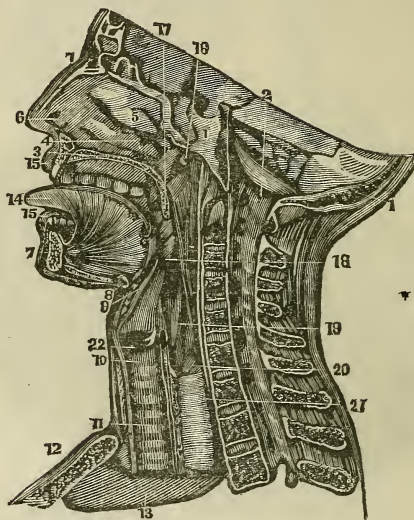


Fig. 22. A view of the muscles of the tongue, palate, larynx, and pharynx, as well as the position of the upper portion of the oesophagus, as shown by a vertical section of the head. 1, 1, 1, The vertical section of the head. 2, Points to the spinal canal. 3, Section of hard palate. 4, The inferior spongy bone. 5, The middle spongy bone. 6, The orifice of the right nostril. 7, Section of the lower jaw bone. 8, Section of the hyoid bone. 9, Section of the epiglottis. 10, Section of the cricoid cartilage. 11, The trachea. 12, Section of the sternum. 13, Inside of the upper portion of the thorax. 14, The tongue. 15, 15, The upper and lower lips. 16, The orifice of the eustachian tube. 17, Section of the soft palate and uvula. 18, The upper portion of the pharynx. 19, The lower portion of the pharynx. 20, 21, The oesophagus. 22, The vocal ligaments.

Ida. What is the appearance of *chyme*?

Mrs. G. A grayish pulp. This pulp passes into the small intestines, the upper portion of which is enlarged for twelve fingers' breadth, and is called the *duodenum*. Here, by the action of the fluids from the pancreas, or sweet-bread, and the bile from the liver, this grayish pulp becomes whiter and more fluid. It is then called *chyle*.

Fig. 23.

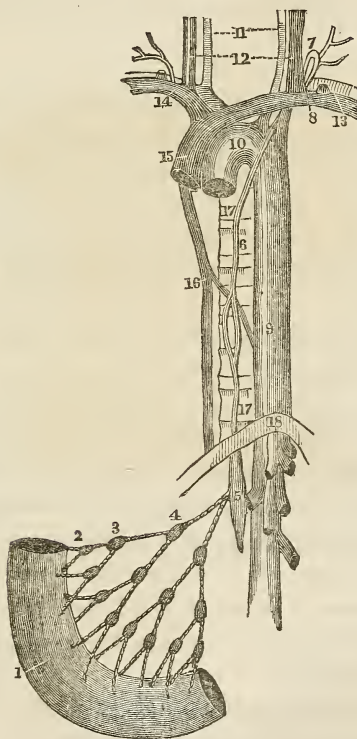


Fig. 23. A section of the small intestines, lacteal vessels, and glands, with the thoracic duct. 1, The intestine. 2, 3, 4, Mesenteric glands. Lacteal vessels pass from the intestines to the gland, 2; from 2 to 3;

from 3 to 4; and from 4 to 5, the commencement of the thoracic duct. 6, The trunk of the thoracic duct. 7, The point at the lower part of the neck, where the duct turns downward to enter the transverse vein at (8.) 9, The descending aorta. 10, The arch of the aorta. 11, The carotid arteries. 12, The jugular veins. 13, The subclavian artery. 14, The subclavian vein. 15, The descending vena cava. 16, The azagos vein. 17, 17, The spinal column. 18, The diaphragm.

Ida. Does not the bile flow into the stomach?

Mrs. G. No, my dear. Many persons suppose so; but when we are well, it never enters the stomach, but flows into the upper portion of the small intestines.

Ida. What becomes of the chyle?

Mrs. G. It is moved along the tract of the small intestines, in connection with the residuum of the food, by a worm-like movement, which brings the chyle in contact with the mouth of the lacteal vessels. These vessels absorb, or drink it up, as a sponge does water, leaving the residual matter to be carried into the large intestines.

Ida. What is the use of the lacteal vessels?

Mrs. G. They convey the chyle through several small bodies, called *mesenteric* glands. It then flows into the canal called the *thoracic* duct, which conveys the chyle to the vein situated behind the collar-bone, on the left side. It then unites with the blood in this vein, passes to the lungs, and there becomes fitted to nourish the system.

Ida. Does every kind of food that we take, pass through this long process, before it nourishes us?

Mrs. G. It does.

Ida. From what you said of the use of the saliva, it is not necessary to drink while we are eating?

Mrs. G. No. The food should be slowly and thoroughly chewed before swallowing it, and there will

be no necessity to wash it down with drink of any kind while we are eating. A small quantity of drink may be taken *after* we have eaten, and not injure digestion.

Ida. How often should we eat?

Mrs. G. That depends on circumstances. Children require food more frequently than aged persons; yet every person should take their food with regularity. Eating a "bit" between meals, or just before going to sleep, is injurious.

Ida. How much food is necessary for the system?

Mrs. G. That depends on two circumstances. 1st. The boy that is growing, needs more food than the man who has attained his stature. 2d. Waste, or a loss of material, attends action; consequently, the person that exercises much, needs more food than one who has but little exercise.

Ida. What kind of food is most healthy?

Mrs. G. That food which has mixed with it a proper amount of nutritious and innutritious matter. The ripe fruits and berries, the Indian and unbolted wheat bread, are more healthy than jellies, fruit-cake, rich pies, and warm flour bread. All kinds of warm bread are injurious, and should be avoided.

Ida. Can food be safely taken in all conditions of the system, provided it is eaten at regular periods?

Mrs. G. It cannot be taken with safety immediately after violent exercise of the muscles, voice, or brain. If we are necessitated to make great exertions, either mental or manual, for a period, never take much food immediately before commencing such exercise, as it will remain unchanged in the stomach, inducing dis-

ease. To illustrate this principle,—feed two dogs upon similar articles of food; let one lie down quiet, and the other be sent in pursuit of game. At the ex-

Fig. 24.

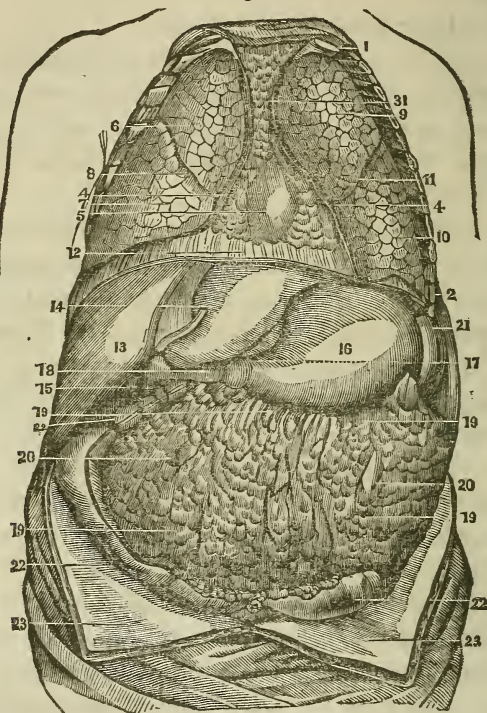


Fig. 24. A view of the organs of the chest and abdomen, in their natural position, as given by the removal of the anterior walls of each cavity. 1, 2, The ribs forming the side of the chest. 3, The fatty tissue in the anterior mediastinum. 4, 4, The section of the pleura of each side. 5, The pericardium, enclosing the heart. 6, The superior lobe of the right lung. 7, The inferior lobe of the right lung. 8, The fissure that separates them. 9, The upper lobe of the left lung. 10, The lower lobe of the left lung. 11, The fissure between them. 12, A transverse section of the diaphragm. 13, The upper face of the right lobe of the liver. 14, The left lobe of the liver. 15, The end of the gall bladder. 16, The stomach. 17, The pylorus. 18, The duodenum. 19, 19, 19, 19, The omentum. 20, 20, The convolutions of the small intestines seen through the omentum. 21, The spleen. 22, 22, 22, The large intestines. 23, 23, The walls of the abdomen turned down.

piration of one hour, have them killed. The stomach of the one that had remained quiet, will be nearly or quite empty, while the food in the other will be found nearly unaltered. In the one, the energies of the system have been concentrated on the stomach; in the other, they have been exhausted on the organs of motion. So it is with man; if his mind or muscles act intensely soon after eating, the stomach will not be sufficiently stimulated to change the food in a suitable period. If food be retained in the stomach an unusual length of time, irritation will be produced.

Ida. Why is it unhealthy to eat immediately before retiring to sleep?

Mrs. G. The brain during perfect sleep is in a state of inaction, and does not supply to the stomach the nervous influence necessary to digest food. We should refrain from eating at least three hours before retiring for sleep.

Ida. Are there other conditions that impair digestion?

Mrs. G. Yes; wearing tight clothing, having the skin uncleanly, and the stooping position in standing and sitting.

CHAPTER IV.

THE LUNGS.

Mrs. G. Our last conversation was about the Digestive Organs, or those organs which lie in the *abdomen*. To-day, we will speak of the LUNGS.

Ida. I am very glad to have you talk about the lungs. Do not some persons call them *lights*?

Mrs. G. Yes; but it is an improper term; it only means they will float on water.

Ida. Where are the lungs situated?

Mrs. G. In the *thorax*, or chest. This cavity lies above the abdomen, and contains most of the organs of respiration or breathing.

Ida. Please name the organs of respiration.

Mrs. G. They are the *lungs* and *trachea*. The *ribs*, *diaphragm*, and several muscles, also, aid in breathing.

Ida. What is the shape of the lungs?

Mrs. G. They are of a conical shape; one on each side of the chest, having the heart between them. The lung on the right side of the chest is divided into three parts, called lobes. The lung on the left side of the chest is divided into two lobes.

Ida. What is the color of the lungs?

Mrs. G. Pinkish gray, mottled, and variously marked with black.

Fig. 25.

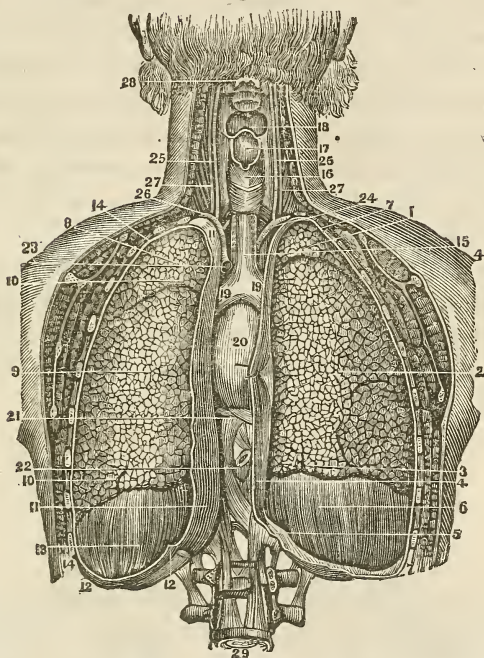


Fig. 25. A posterior view of the thoracic organs, showing their relative position, by the removal of the posterior portion of the walls of the chest. 1, 2, The upper and lower lobes of the right lung. 3, Interlobular fissures. 4, The internal portion of the pleura costalis, forming one of the sides of the posterior mediastinum. 5, The twelfth rib and lesser diaphragm. 6 and 13, The diaphragm. 7, The right pleura costalis, adhering to the ribs. 8, 9, The two lobes of the left lung. 10, 10, Interlobular fissures. 11, The left pleura, forming the walls of the posterior mediastinum. 12, 12, Its reflections over the diaphragm on this side. 14, 14, The left pleura costalis on the walls of the chest. 15, The trachea. 16, The larynx. 17, The opening of the larynx and the epiglottis cartilage. 18, The root and top of the tongue. 19, 19, The right and left bronchi. 20, The heart, enclosed in the pericardium. 21, The upper portion of the diaphragm, on which it rests. 22, A section of the œsophagus. 23, A section of the aorta. 24, The arteria innominata. 25, 25, The primitive carotid arteries. 26, The subclavian arteries. 27, 27, The internal jugular veins. 28, The second cervical vertebra. 29, The fourth lumbar vertebra.

Ida. Of what are the lungs composed?

Mrs. G. Of several sets of vessels, held together by *cellular* membrane. Each lung is enclosed, and its structure maintained by a membrane, called the *pleura*.

Ida. Does the pleura entirely cover the lungs?

Mrs. G. It does; and also lines the inner surface of the chest. That part of the membrane which encloses the lungs is called the *pleura pulmonalis*, and that portion in contact with the ribs, *pleura costalis*.

Ida. How does the air reach the lungs?

Mrs. G. It passes through the nostrils or mouth, and enters a long canal, called the trachea or windpipe. It is then distributed to some minute tubes that are found in every part of the lungs, and the air is conveyed through them to the bronchial or air-cells.

Fig. 26.

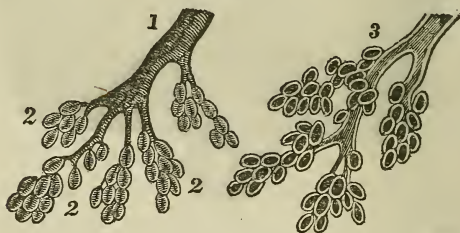


Fig. 26. 1, A bronchial tube. 2, 2, 2, Air-cells or vesicles. Both the tube and vesicles are much magnified. 3, A bronchial tube and vesicles laid open.

Ida. You said, Mrs. G. in a previous conversation, that the blood was changed in the lungs. What color is it when it enters the lungs?

Mrs. G. The blood, when it enters the lungs, is dark colored; but, as soon as it comes in contact with the air, it becomes a bright red, or scarlet color.

Ida. How does the blood come in contact with the air in the lungs?

Mrs. G. From the right side of the heart, the impure dark blood is conveyed into the lungs, through the *pulmonary artery*. This artery divides and subdivides, until the vessels become so small as to resemble hairs in size; hence, they are called *capillary* or hair-like vessels. These small vessels pass over the thin walls of the air-cells. Here the blood, which is forced from the heart into these minute tubes, is separated from the air, by the thin walls of the air-cells, and coats of the capillary vessels. At this point, the air in the cells, acting upon the blood in the capillary vessels, changes the dark impure blood to a bright red, or scarlet hue. It is then returned, through the *pulmonary veins*, to the left side of the heart.

Fig. 27.

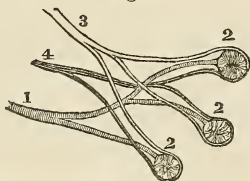


Fig. 27. 1, represents a bronchial tube, dividing into three branches, which terminate in three air-vesicles (2, 2, 2.) 3, A branch of the pulmonary artery, dividing into three branches, that are seen ramifying upon the air-vesicles (2.) 4, A pulmonary vein, formed by the union of smaller veins, that connect with the capillary arteries upon the vesicles 2, 2, 2.

Ida. What property has the air, that causes the blood to become a scarlet color?

Mrs. G. It is found by examination, that atmospheric air consists of two gases, *oxygen* and *nitrogen*; with these are combined a small proportion of *carbonic acid gas*, and also the effluvia of flowers. The change in the appearance of the blood is owing to the oxygen it receives from the air, and the loss of carbonic acid, which passes through the coats of the air-cells.

Ida. You mentioned carbonic acid gas; does it not destroy life?

Mrs. G. It does, when not properly combined with other gases; and for this reason, no person should ever enter wells or caves, without previously passing a burning taper into them. If the taper is extinguished, it shows that more of this injurious gas exists there than oxygen, and that they should not be entered.

Ida. Has the air, which is exhaled or thrown out of the lungs, the same properties as the air breathed into the lungs?

Mrs. G. The air inhaled into the lungs contains one part of oxygen to four parts of nitrogen. The air exhaled from the lungs, contains all the nitrogen inspired, but only a portion of the oxygen. It likewise contains carbonic acid and water in a state of vapor. This vapor is perceptibly seen when we enter the cold air.

Ida. Is it healthy, then, for many persons to sit or sleep in a room where the air is not constantly changing?

Mrs. G. There is nothing more injurious to our health than breathing impure air; whether it is the air that we have breathed over once, or more than once in a close room, or made impure by the breathing of other persons: hence, sleeping rooms and other apartments should be ventilated.

Ida. Can the blood be made impure by any other means than by breathing impure air?

Mrs. G. Most certainly; by diminishing the size of the chest with tight clothing, and, consequently, diminishing the size of the lungs, and also by having the skin uncleanly.

Fig. 28.

Fig. 29.



Fig. 28 is a correct outline of the Venus de Medicis, the *beau idéal* of female symmetry.

Fig. 29 is an outline of a well corseted modern beauty. One has an artificial, insect waist; the other, the natural waist of woman. One has sloping shoulders; while the shoulders of the other are comparatively elevated, square, and angular. The proportion of the corseted female below the waist is also a departure from the symmetry of nature.

Ida. Persons, then, that have broad and unrestricted chests can breathe more freely and easily, than those with small and compressed waists?

Mrs. G. Undoubtedly. In the first place, the lungs in a contracted chest cannot receive air enough into their cells to purify the blood properly. In the second place, the wearing of tight dresses prevents the free movement of the ribs and diaphragm.

Ida. Do the air-cells in the lungs always contain air?

Mrs. G. Yes; a small quantity, after they have once been filled; and should you see a person apparently dead from drowning, try to induce breathing by intro-

ducing, as soon as possible, the nozzle of a pair of common bellows into the mouth, upon the base of the tongue, or into one nostril; at the same time, surround the mouth, and cover the open nostrils with a towel. Then force air into the lungs to inflate them; as soon as the air-cells are filled, force the air out, by pressing upon the lower part of the chest and abdomen. Continue artificial respiration, as described, for two hours, without cessation, unless the patient is sooner resuscitated. Surround the body with warm flannels; avoid all friction until breathing shall be in some degree established. In cases of suspended animation, by inhaling carbonic acid gas, or by strangulation from hanging, the treatment is similar to that of drowned persons.

CHAPTER V.

THE VOICE.

Mrs. G. The voice is the next topic that I shall treat of.

Ida. Where is the voice formed ?

Mrs. G. In the LARYNX ; but several other organs aid in making sound.

Ida. Where is the larynx situated ?

Mrs. G. It is a kind of cartilaginous box, situated below the chin, and at the top of the trachea, with which it communicates. Within the larynx is found two thin ligaments, called *vocal cords*.

Ida. Of what use are the vocal cords ?

Mrs. G. They are the principal agents in speaking and singing.

Ida. Are these the only agents in speaking ? I thought the tongue was the organ of speech.

Mrs. G. It was formerly supposed so ; but persons who have had their tongues removed, have been able to utter words distinctly. The tongue, as well as the teeth, lips, lungs, and other organs, aid in the formation of the voice.

Ida. Does impure air affect sound ?

Mrs. G. It does ; the purer the air, the clearer and more harmonious will sound be.

Fig. 30.

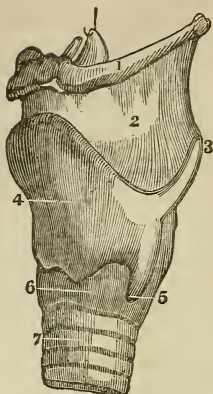


Fig. 31.

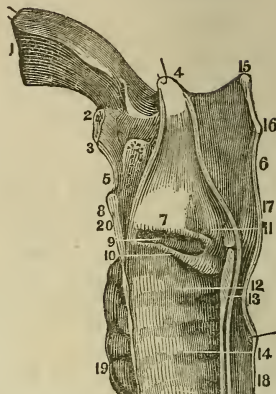


Fig. 30 represents a lateral view of the cartilages and ligaments of the larynx. 1, The os hyoides. 2, A ligament which connects the hyoid bone with the thyroid cartilage. 3, The large horn of the thyroid cartilage. 4, The angle and side of this cartilage. 5, The small horn of this cartilage. 6, The lateral portion of the cricoid cartilage. 7, Rings of the trachea.

Fig. 31 represents a vertical section of the larynx. 1, A section of the root of the tongue. 2, The os hyoides. 3, The muciparous glands of the epiglottis. 4, The top of the epiglottis cartilage. 5, A section of its anterior face. 6, A fold of mucous membrane. 7, The superior vocal ligament. 8, A section of the thyroid cartilage. 9, The ventricle of the larynx. 10, The lower vocal ligament. 11, The arytenoid cartilages. 12, Inside of the cricoid cartilage. 13, Its posterior portion. 14, The lining membrane of the trachea. 15, The end of the cornu major of the os hyoides. 16, The cornu major of the thyroid cartilage. 17, The mucous membrane of the pharynx. 18, The cesophagus. 19, The thyroid gland.

Ida. Does not this fact point to the necessity of ventilating school houses, singing halls, and other rooms frequented by persons?

Mrs. G. It does; and no individual should lecture or teach in a room that is not ventilated.

Ida. Does the position of a person affect the voice?

Mrs. G. It does, in a striking manner. When the head is erect, the larynx is brought forward, and the movement of all the vocal organs is more free and

effective. Reading or singing should not be performed in a stooping position.

Ida. The erect attitude must also be assumed in sitting?

Mrs. G. Truly, only that it is more important, if we wish good digestion and efficient vocal organs, that we sit erect, not only when reading or singing, but also when writing.

Fig. 32.



Fig. 33.



Fig. 32 represents an improper position; but one not unfrequently seen in some of our common schools, and in some of our public speakers.

Fig. 33 represents the proper position for reading, speaking, and singing.

Fig. 34.



Fig. 35.



CHAPTER VI.

THE CIRCULATORY SYSTEM.

Mrs. G. The subject of this chapter will be the passage of the blood through the HEART, ARTERIES, and VEINS.

Ida. Of what is the blood composed ?

Mrs. G. You undoubtedly recollect in Chapter III. that the food, by the action of the digestive organs and lungs, is changed into a fluid of a red color. This is composed of two parts; a watery fluid called *serum*; and a solid portion, called the *coagulum* or *clot*. The coagulum contains concreted *albumen*; a white substance which forms on the upper surface, called *fibrine*; and red globulated matter, which is found on its lower surface.

Ida. Is the blood always red ?

Mrs. G. Not necessarily so. It may be white, as in the fish; transparent, as in the insect; or yellowish, as in the reptile. There is no animal in which the blood is red in all parts of the body. The ligaments and tendons in man are not supplied with red, but with white blood.

Ida. Of what use is the blood ?

Mrs. G. It contains all the material necessary for

the growth of organs, as well as to repair their waste ; consequently, it furnishes to all parts the matter of which they are in need for their nourishment, and also imparts the excitement necessary to the maintenance of life.

Ida. What causes the blood to circulate through the system ?

Mrs. G. It is effected by the action of the heart, and compression of the muscles while in action.

Ida. Please describe the heart.

Fig. 36.

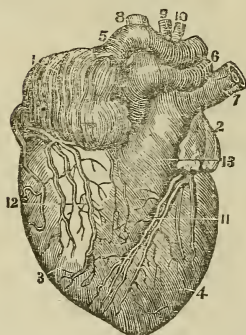


Fig. 37.

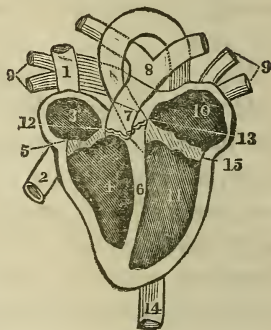


Fig. 36. An anterior view of the heart in a vertical position, with its vessels injected. 1, The right auricle. 2, The left auricle. 3, The right ventricle. 4, The left ventricle. 5, The descending vena cava. 6, The aorta. 7, The left pulmonary artery. 8, The arteria innominata. 9, The left primitive carotid artery. 10, The left subclavian artery. 11, The anterior cardiac vessels in the vertical fissure. 12, The posterior vessels from the transverse fissure. 13, The main trunk of the pulmonary artery.

Fig. 37. A view of the heart with its several chambers, and the vessels in connection with them. 1, The superior vena cava. 2, The inferior vena cava. 3, The right auricle. 4, The right ventricle. 5, The situation of the tricuspid valves. 6, The partition between the two ventricles. 7, The pulmonary artery. 8, The point where it divides into the right and left pulmonary artery for the corresponding lungs. 9, 9, The four pulmonary veins that bring the blood into the left auricle (10.) 11, The left ventricle. 12, The situation of the mitral valves. 13, The situation of the sigmoid valves of the aorta. 14, The situation of the sigmoid valves of the pulmonary artery.

Mrs. G. It is a kind of fleshy pouch, placed obliquely in the left cavity of the chest. It receives into its cavities blood from the veins, and, by contracting on itself from time to time, forces the blood into the arteries, thus maintaining the circulating current.

Ida. I have frequently heard butchers and others talk of the "deaf ear," in the heart of the ox and sheep; is there a part of the heart of man of a similar character?

Mrs. G. The heart of man, as well as that of domestic animals, is a double organ; or it is divided into two parts or sides. Each side is divided into an *auricle* and *ventricle*. It is the auricle that the butchers call the "deaf ear."

Ida. What divides each side of the heart into two cavities?

Mrs. G. The auricles and ventricles are separated from each other by thin folds of skin, called valves. Between the auricle and ventricle of the right side of the heart, there are three valves, called the *tricuspid*; between the auricle and ventricle of the left side are two, called the *mitral* valves.

Ida. What is the function or use of these valves?

Mrs. G. To answer your question, I must explain the manner in which the blood circulates through the heart. The dark blood is poured from two vessels, called the ascending and descending *cavas*, into the right auricle of the heart; by the contraction of the auricle, the blood is thrown into the right ventricle, and the tricuspid valves prevent its reflow; by the

contraction of the ventricle the blood is then forced into the *pulmonary artery*,* which divides into two

Fig. 38.

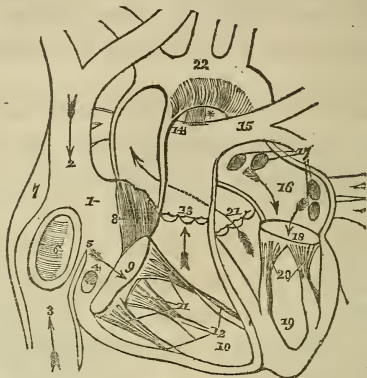


Fig. 38. 1, The right auricle of the heart. 2, The entrance of the superior vena cava. 3, The entrance of the inferior vena cava. 4, The opening of the coronary vein, half closed by the coronary valve. 5, The Eustachian valve. 6, The fossa ovalis, surrounded by the annulus ovalis. 7, The tuberculum Loweri. 8, The muscoli pectinati in the appendix auriculæ. 9, The opening of the right auricle into the left ventricle. 10, The cavity of the right ventricle. 11, The tricuspid valves, attached by the chordæ tendinæ to the carnæ columnæ, (12.) 13, The pulmonary artery, guarded at its commencement by three semi-lunar valves. 14, The right pulmonary artery, passing beneath the arch, and behind the ascending aorta. 15, The left pulmonary artery, crossing in front of the descending aorta. * The remains of the ductus arteriosus, acting as a ligament between the pulmonary artery and the arch of the aorta. The arrows mark the course of the venous blood through the right side of the heart. Entering the auricle by the superior and inferior cavæ, it passes through the opening of the auricle into the ventricle, and thence through the pulmonary artery into the lungs. 16, The left auricle. 17, The openings of the four pulmonary veins. 18, The opening of the left auricle into the left ventricle. 19, The left ventricle. 20, The mitral valves, attached by their chordæ tendinæ to two large columnæ carneæ, which project from the walls of the ventricle. 21, The commencement and course of the ascending aorta behind the pulmonary artery, marked by an arrow. The entrance of the vessel is guarded by three semi-lunar valves. 22, The arch of the aorta. The comparative thickness of the two ventricles is shown in the diagram. The course of the pure blood through the left side of the heart is marked by arrows. The blood is brought from the lungs by the four pulmonary veins, into the left auricle, and passes through the opening between the auricle and ventricle into the left ventricle, whence it is conveyed by the aorta to every part of the body.

* All the tubes, or canals, that convey blood *from* the heart, are named *arteries*, while those that convey blood *to* the heart are called *veins*. The names artery and vein have no reference to the color of the blood which flows through them.

branches, one of which passes to the right, and the other to the left lung, where they divide into a great number of branches. These hair-like vessels pass over the air-cells. The blood becomes purified, and is returned through the *pulmonary veins* to the left auricle of the heart. By the contraction of this auricle, the red blood is thrown into the left ventricle, and the mitral valves prevent its reflux. By the strong

Fig. 39.

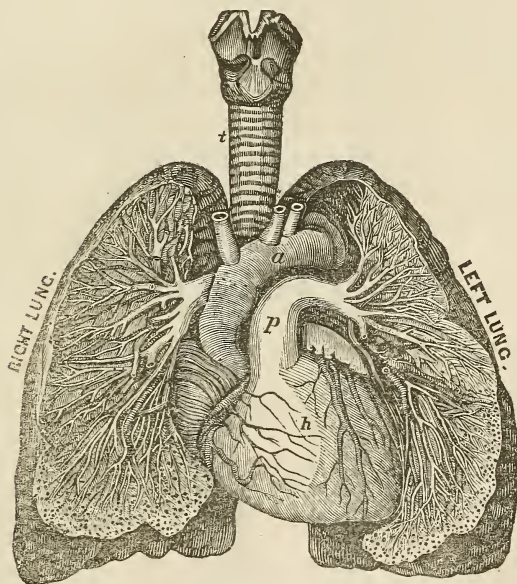


Fig. 39. *t*, Represents the trachea. *h*, The heart. *a*, The aorta. *p*, The pulmonary artery, which divides under the arch of the aorta into two branches. These branches divide and subdivide into smaller vessels, which spread through every part of the right and left lung; and they terminate in the capillary vessels of the lungs. The capillary vessels ramify upon the air-cells, represented by the small dark points around the margin of the lungs.

contractile power of the thick walls of the left ventricle, the pure blood is sent in to the *aorta*.

Fig. 40.

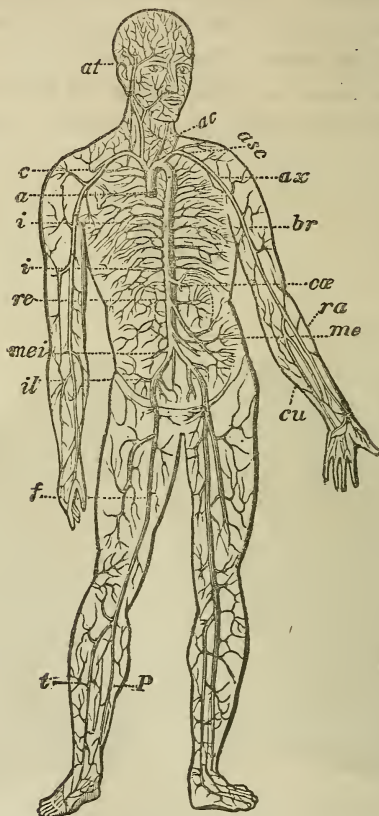


Fig. 40 represents the aorta and its branches. *a*, The aorta. *c*, Arch of the aorta. *ac*, Carotid arteries. *at*, Temporal arteries. *asc*, Subclavian artery. *ax*, Axillary artery. *br*, Brachial artery. *ra*, Radial artery. *cu*, Cubital or ulnar artery. *i, i*, Intercostal arteries. *cæ*, Coeliac artery. *re*, Renal arteries. *me, mei*, Superior and inferior mesenteric arteries. *il*, Iliac arteries. *f*, Femoral arteries. *t*, The tibial artery. *p*, The peroneal artery.

Ida. The walls of the two ventricles, then, have not the same thickness?

Mrs. G. They have not; and the mitral valves are stronger and thicker than the tricuspid.

Ida. Is the aorta the vessel that conveys the pure blood to every part of the system?

Mrs. G. Precisely so; every part of the animal frame is supplied with blood from the aorta and its branches.

Ida. How is the blood brought to the heart?

Mrs. G. By a set of vessels called *veins*. They are more numerous than the arteries, but their coats or walls are not so thick or strong.

Ida. Where do the veins commence?

Mrs. G. At the extremities of the arteries are found hair-like vessels, called *capillaries*. These vessels unite the arteries and veins at one extremity, while the heart connects them at the other.

Ida. Do the veins follow the course of the arteries?

Mrs. G. Nearly the same course; but, as they are more numerous, we find them nearer the surface of the skin than the arteries. The almost countless number of small veins unite to form two large veins, called *cavas*. Through the *cavas*, the blood is poured into the heart.

Ida. When we prick our fingers, or any part of the skin, is it the veins or arteries that we wound?

Mrs. G. Not either, strictly speaking, but the *capillaries*.

Ida. How often does the blood circulate through the system?

Fig. 41.

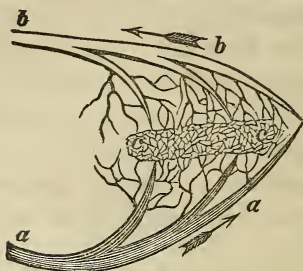


Fig. 41. *a, a*, An artery dividing into several branches that terminate in capillaries *c, c*. *b, b*, A venous trunk formed from several small veins, that commence in the capillaries.

Mrs. G. Ordinarily, a complete revolution is effected once in three minutes. The ventricles contract, or the "pulse" beats, about seventy-five times each minute in an adult, more than one hundred times in infants, and less than seventy in aged persons.

Ida. How much blood does a common-sized man contain?

Mrs. G. Between twenty-five and thirty-five pounds, or about one-fifth part of the weight of the whole body.

Ida. What causes the blood to circulate sometimes faster than at others?

Mrs. G. The causes are various. When a considerable number of muscles are called into energetic action; when the ribs and diaphragm move without restriction; when the skin is kept clean by frequent bathing; warm by sufficient clothing; and when we breathe pure air, the blood circulates more rapidly and is purer than when opposite conditions exist.

Ida. Does the blood stop circulating when we faint?

Mrs. G. The contraction of the ventricles of the heart is only diminished in force in some instances of fainting; in other cases, there is a complete cessation of the action of the heart.

Fig. 42.

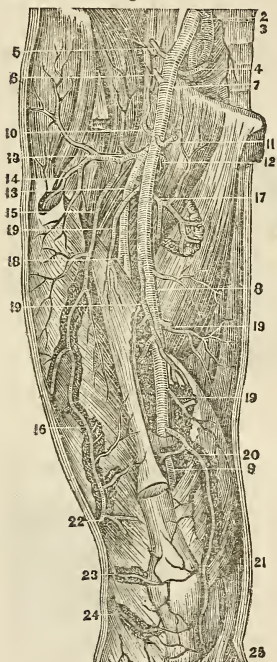


Fig. 43.

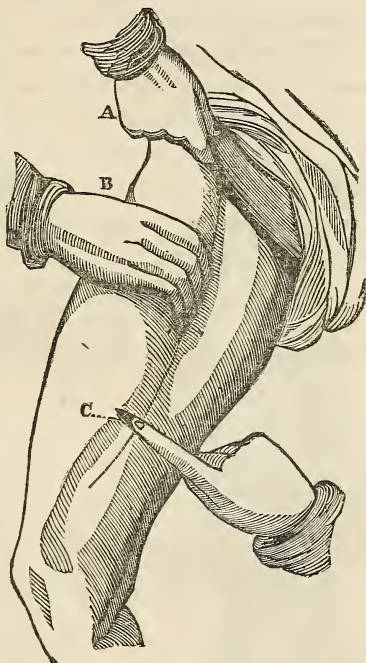


Fig. 42 represents the track of the femoral artery. 7, The femoral artery where it passes over the pelvic bones. This is the point where compression at the groin is made. (See A, fig. 43.) 8, The femoral artery at the middle part of the thigh. This is the point where the artery may be compressed with the fingers. (See B, fig. 43.)

Fig. 43 represents the different methods of compressing arteries to arrest hemorrhage from divided vessels. A, The method of compressing the femoral artery at the groin, with the thumb, or a compress. B, The method of compressing the femoral artery below the groin, with the fingers. C, The method of compressing the mouth of the divided artery in the wound, with the fingers. The dotted lines indicate the course of the artery.

Ida. When an artery is divided, how is the bleeding stopped?

Mrs. G. If any large artery be severed, the blood will be thrown out in jets or jerks, and will be of a bright red color. The effusion may be so great as to endanger life.

When such accidents occur, the person wounded, or some individual who may be present, should arrest the

Fig. 44.

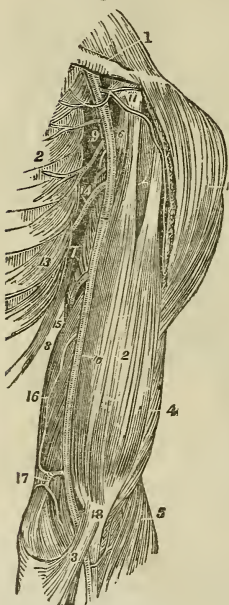


Fig. 45.



Fig. 44 represents the track of the axillary and brachial artery. 1, The clavicle, under which lies the subclavian artery. Under the clavicle, upon the first rib, the artery may be compressed. (See B, fig. 45.) 9, The axillary artery. 10, The brachial artery. At this point, the artery may be compressed by the fingers. (See A, fig. 45.)

Fig. 45. B represents the method of compressing the subclavian artery upon the first rib under the clavicle. A, The method of compressing the brachial artery with the fingers. C, The method of compressing the divided extremity of an artery in the wound, with the finger.

bleeding, by making pressure upon the artery, between the heart and the point of its division, or by using compression directly upon the open mouth of the divided vessel. The best instrument to use in compressing bleeding arteries, is the finger.

If a person receive a wound in the foot, leg, or thigh, and it bleed profusely, the hemorrhage should be arrested immediately, or life will be sacrificed. This may be done by making forcible compression with three or four fingers of one or both hands, on the upper and inner part of the thigh, over the course of the main femoral artery; or by making compression in the wound, upon the open mouth of the bleeding vessel. This last is the most certain and best means of making pressure to arrest hemorrhage.

If the wound should be in the upper part of the

Fig. 46.

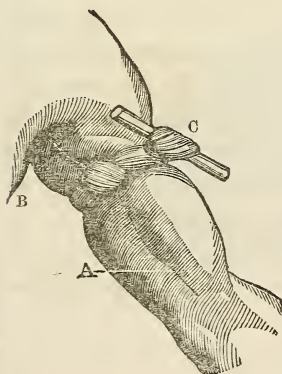


Fig. 47.

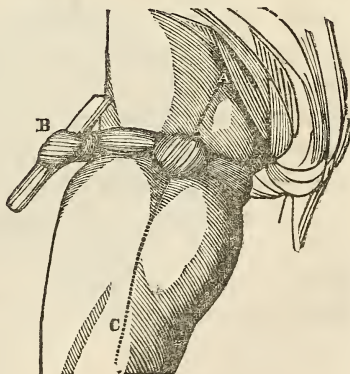


Fig. 46. A, B, The track of the brachial artery. C, The method of applying the knotted handkerchief to make compression on this artery.

Fig. 47. A, C, The track of the femoral artery. (See fig. 42.) B, The method of applying the knotted handkerchief to make compression on this artery.

thigh, then compression should be made on the artery where it passes over the bone of the groin. It can easily be found by its pulsation. If the wound should occur in the hand, fore-arm, or arm, the brachial artery may be compressed with three or four fingers, or the subclavian compressed above and behind the clavicle, where it passes over the first rib ; or, which is preferable, pressure may be made in the wound, upon the mouth of the bleeding vessel.

After making compression, as described and illustrated, you should request some person to twist a handkerchief cornerwise, and tie a hard knot midway between the two ends. This knot should then be placed over the artery, between the wound and the heart, and the two ends carried around the limb, and loosely but firmly tied. A stick, five or six inches long, should then be passed under the handkerchief, which should be twisted, until the knot has made sufficient compression on the artery to allow the removal of the fingers without a return of the hemorrhage. Continue this compression until the surgeon arrives, who will proceed to put ligatures around the divided and bleeding vessels, or pursue such a course as he may deem proper for the welfare of the patient.

The wound ought not to be stuffed with pieces of cloth or lint ; nor should salt, or any irritating application whatever, be applied to it.

CHAPTER VII.

THE NERVOUS SYSTEM.

Mrs. G. As the organs of the abdomen and chest have been described, we will pass to the BRAIN and NERVES.

Fig. 48.

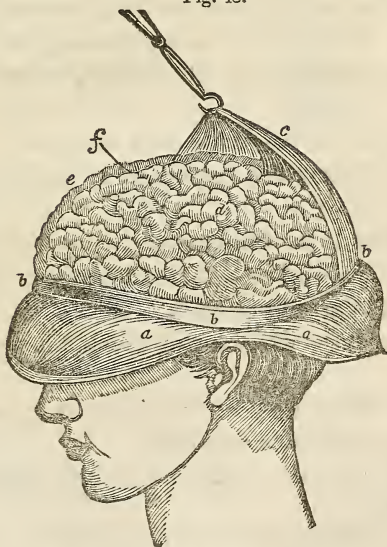


Fig. 48. *a, a*, represent the scalp turned down. *b, b, b*, The cut edge of the bones of the skull. *c*, The external strong membrane of the brain, the dura mater, suspended by a hook. *d*, The left hemisphere of the brain, showing its convolutions. *e*, The superior edge of the right hemisphere. *f*, The fissure between the two hemispheres.

Ida. Where is the brain situated?

Mrs. G. Within the skull bones. It is divided into the *Cerebrum*, *Cerebellum*, and *Medulla Oblongata*.

Ida. Does the brain come in contact with the skull bones?

Mrs. G. It is surrounded by three membranes, or skins. The external membrane is called the *dura mater*, from its firmness; the middle is called the *arachnoid*, or spider's web membrane; the internal is called the *pia mater*, or soft membrane.

Ida. In what part of the brain is the cerebrum?

Mrs. G. It occupies the upper and front part of the cavity within the skull bones.

Ida. What is the function of this part of the brain?

Mrs. G. Philosophers and physiologists ascribe to the cerebrum the faculties of *thinking*, *memory*, and the *will*.

Ida. Where is the cerebellum situated?

Mrs. G. Below the cerebrum, at the back part of the skull.

Ida. What is the function of the cerebellum?

Mrs. G. The lower or animal propensities are ascribed to this part of the brain.

Ida. Are these divisions of the brain of the same size?

Mrs. G. They are not: the cerebrum is about seven times larger than the cerebellum.

Ida. Is there any difference in the appearance of the two parts?

Mrs. G. There is: in the cerebrum, the white substance is surrounded by an irregular border of gray matter; while the white material of the cerebellum is so

arranged as to resemble the trunk and branches of a tree. Hence, it is called *arbor vitæ*.

Fig. 49.

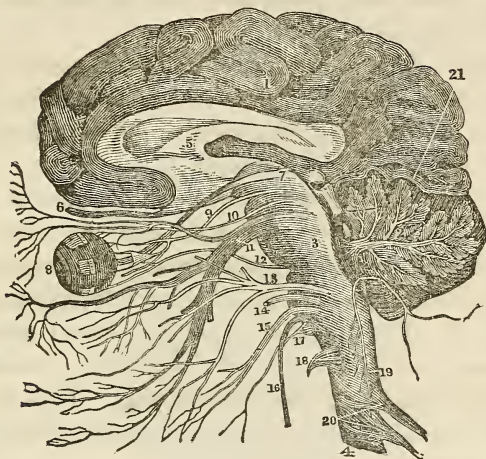


Fig. 49 represents a vertical section of the cerebrum, cerebellum, and medulla oblongata, showing the relation of the cranial nerves at their origin. 1, The cerebrum. 2, The cerebellum, with its *arbor vitæ* represented. 3, The medulla oblongata. 4, The spinal cord. 5, The corpus callosum. 6, The first pair of nerves. 7, The second. 8, The eye. 9, The third pair of nerves. 10, The fourth pair. 11, The fifth pair. 12, The sixth pair. 13, 14, The seventh pair. 15, 16, 17, The eighth pair. 18, The ninth pair. 19, The spinal accessory nerve. 20, Spinal nerves. 21, The membrane that separates the cerebrum from the cerebellum.

Ida. What is the medulla oblongata?

Mrs. G. It is that portion of the *spinal cord*, or spinal marrow, which is within the skull.

Ida. Has the spinal cord an intimate connection with the functions of the brain?

Mrs. G. All the nerves of sensation and motion have their origin at the base of the brain or spinal cord. These nerves pass off in pairs.

Ida. How many proceed from the brain?

Mrs. G. Nine pairs. They are divided into four groups; nerves of *Special Sense*, of *Motion*, of *Respiration*, and *Spinal Nerves*.

Ida. How many pairs, and what is the use of the nerves of special sense?

Mrs. G. There are three pairs arranged in this group. 1st, *Olfactory*, or the nerve of smell. 2d, *Optic*, or nerve of sight. 3d, *Auditory*, or nerve of hearing.

Ida. How many of motion?

Mrs. G. Three pairs; which are distributed to the six muscles that move the eye; and the ninth pair, *Hypo-glossal*, or the nerve that moves the tongue.

Ida. What pairs are called the respiratory nerves?

Mrs. G. The 4th, *Patheticus*, distributed to one of the muscles of the eye; a part of the 7th, *Facial*, distributed to the face; and the 8th pair. This consists of three nerves, *Glosso-pharyngeal*, *Pneumogastric*, and *Spinal Accessory*.

Ida. There is but one pair, then, in the last group?

Mrs. G. Precisely so; the 5th, *Trifacial*. The function of this nerve is sometimes peculiarly interesting.

Ida. In what instance is it peculiarly interesting?

Mrs. G. This nerve is distributed to the teeth, and spread over the side of the face. When a portion of its branches becomes irritated or diseased, we have the disagreeable pain, the *toothache*, or the affection called the *Tic Doloieux*. One of the branches of this nerve is spread over the tongue, and constitutes the nerve of taste.

Ida. How many pairs of nerves proceed from the spinal cord?

Mrs. G. There are thirty-one pairs, each arising from two roots; a *motive*, or an anterior; and a *sensitive*, or posterior root. Each nerve is surrounded by a *neurilema*, or sheath.

Fig. 50.

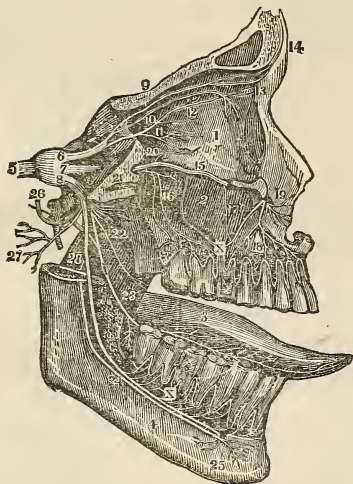


Fig. 50 represents the distribution of the fifth pair of nerves. 1, The orbit. 2, The antrum of the upper jaw. 3, The tongue. 4, The lower jaw. 5, The root of the fifth pair of nerves, forming the ganglion of Casser. 6, The first branch of the fifth pair, or ophthalmic. 7, The second branch of the fifth pair, or superior maxillary. 8, The third branch of the fifth pair, or inferior maxillary. 9, The frontal branch, dividing into external and internal frontal nerves. 10, The lachrymal branch of the fifth pair. 11, The nasal branch. 12, The internal nasal nerve. 13, The external nasal nerve. 14, The external and internal frontal nerve. 15, The infra-orbital nerve. 16, The posterior dental branches. 17, The middle dental branch. 18, The anterior dental nerve. 19, The terminating branches of the infra-orbital nerve. 20, The malar branch. 21, The pterygoid, or recurrent nerve. 22, The five anterior branches of the third branch of the fifth pair. 23, The lingual branch of the fifth, joined by the chorda tympani. 24, The inferior dental nerve. 25, Its mental branches. 26, The superficial temporal nerve. 27, The auricular branches. 28, The mylo-hyoid branch. x, x, A tooth in the upper and lower jaw, divided, so as to exhibit the roots traversed by nerves from the fifth pair, which ramify on the pulp situated in the crown.

Ida. Have these roots different functions?

Mrs. G. They have. Those parts that require

sensation for their safety, and the performance of their functions, are supplied with *sensitive* nervous filaments. The muscular fibres, that possess the property of shortening, are supplied with *motor* nervous filaments, by the agency of which the muscles are enabled to contract.

Fig. 51.

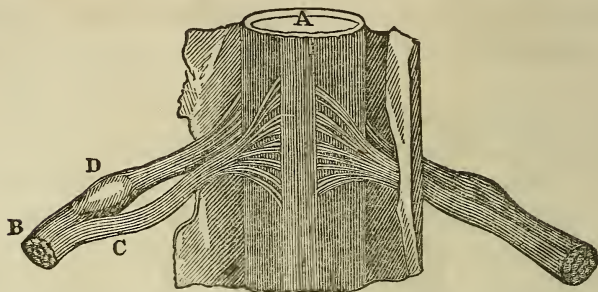


Fig. 51. A represents the spinal cord, surrounded by its sheath. B, A, Spinal nerve, formed by the union of the motor root, (C,) and the sensitive root, (D.) At D, the ganglion upon this root is seen.

Ida. Where are the sensitive nervous filaments chiefly distributed?

Mrs. G. They are mostly distributed to the skin.

Ida. Are the spinal nerves divided into groups, as well as the cranial nerves?

Mrs. G. They are; called the *Cervical*, *Dorsal*, *Lumbar*, and *Sacral*.

Ida. How many pairs belong to each group?

Mrs. G. Eight to the cervical, or neck; twelve to the dorsal, or back; five to the lumbar, or loins; six to the sacral, or sacrum.

Ida. Is the brain subject to the same general laws as other organs of the system?

Mrs. G. It is; and when these laws are violated, disease is the result.

Fig. 52.

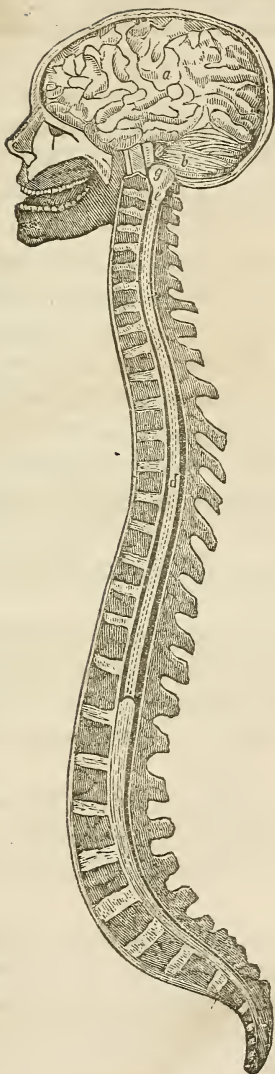


Fig. 53.

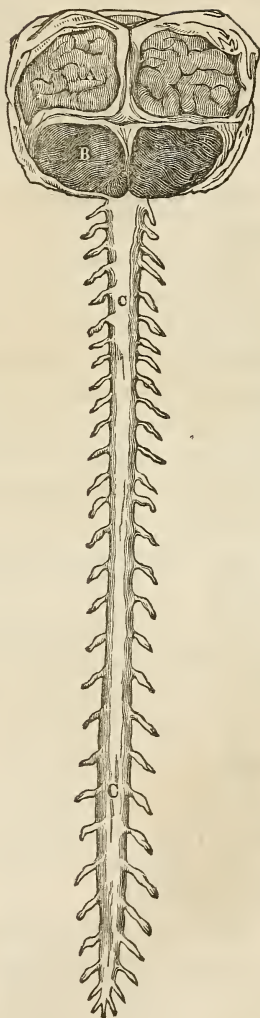


Fig. 52. *a*, The cerebrum. *b*, The cerebellum. *g*, The medulla oblongata. *e*, The pons varolii, or bridge of Varolius. *c, d*, The spinal cord. The brain, spinal cord, and bones of the vertebral column, are represented as divided into two halves.

Fig. 53 represents the spinal cord, surrounded by its sheath. *A*, The posterior lobe of the cerebrum. *B*, The cerebellum. This is separated from the cerebrum, by a process of the dura mater named the tentorium. *c, c*, The spinal cord, surrounded by its sheath. Twenty-nine pairs of nerves are seen coming from it, each nerve having an enlargement called a ganglion.

Ida. What are some of the causes of diseases of the brain?

Mrs. G. Perhaps the most common cause in youth is continued mental excitement. This unhappy result is brought on by severe study, anxiety, and watching. Sometimes from exaltation of feeling. From the want of proper intervals of rest, the excitement of the vessels of the brain, which always accompanies activity of the mind, has not time to subside. Hence, sleeplessness follows, and frequently the digestive organs become impaired.

Ida. What is the consequence if we do not use the brain?

Mrs. G. If it is doomed to inactivity, its health will become impaired, and the mental operations and feelings will become dull, feeble, and slow.

Ida. The brain, then, should be duly used, after regular intervals of rest?

Mrs. G. Certainly; and it also requires a due supply of properly purified blood to keep it in health.

Ida. When is it improper to call the brain into active exercise?

Mrs. G. We should never engage in severe study, or arouse deep feeling, immediately after a full meal, or late at night. If we are obliged to undergo much mental labor, let it be done early in the day.

Ida. What should be done in injuries of the head, before a physician arrives?

Mrs. G. In injuries of the brain the symptoms are usually alarming, and all should possess some information for such contingencies. In general, such accidents are attended by insensibility; the skin and extremities are pale and cold, the pulse is very weak and feeble, and the circulation is much reduced in power; the respiration, also, is less deep, full, and complete, and is reduced in frequency.

Treatment.—In the first instance, the individual should be placed in pure air, friction and dry warmth should be applied to the pallid and cold skin. This should be assiduously persevered in, until heat and color are restored to the skin and limbs, and due action of the heart and arteries has been established. Mild stimulants may also be used internally, with much advantage. The sympathizing friends should not be permitted to stand about the patient, as they cause the air to become impure, as explained in Chapter IV. There should be no bleeding, until the skin and extremities become warm.

Fig. 54.

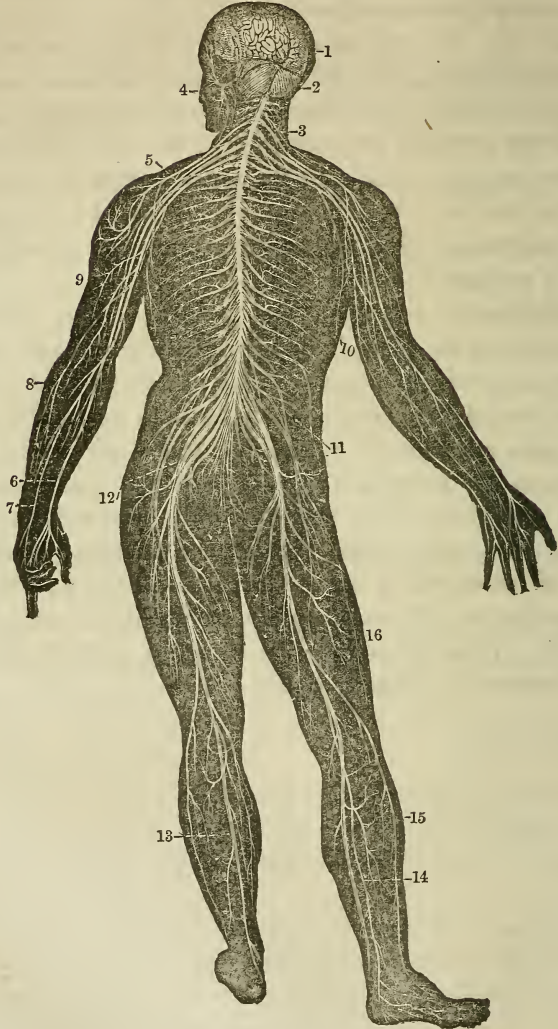


Fig. 54. A posterior view of the brain and spinal cord. 1, The cere-

brum. 2, The cerebellum. 3, The spinal cord. 4, The facial nerve. 5, The brachial plexus, formed by the union of many nerves, which proceed from the spinal cord. 6, The median nerve of the arm. 7, The ulnar nerve. 8, The internal cutaneous nerve. 9, The radial and muscular cutaneous nerve of the arm. 10, The intercostal nerve. 11, The lumbar plexus, formed by the union of many nerves, which proceed from the spinal cord. 12, The sciatic plexus, which gives origin to the principal nerves of the lower extremities. 13, The tibial nerve. 14, The peroneal nerve. 15, The saphenous nerve. 16, The sciatic nerve.

CHAPTER VIII.

THE SKIN.

Ida. In the last conversation, you mentioned that the nerves of sensation were spread over the skin; will you tell us something of this part of the body?

Mrs. G. Certainly. The skin is composed of two layers of membrane. The external layer is called the *cuticle*; the internal layer is called the *cutis vera*, or true skin.

Ida. How is the cuticle formed?

Mrs. G. At first, it is a fluid thrown out by the blood vessels, and spread over the surface of the cutis. While successive layers are formed on the upper surface of the cutis vera, the outer layers become dry, and resemble small scales.

Ida. What is the use of the cuticle?

Mrs. G. It shields the delicate nerves of the cutis, and covers the mouths of the *absorbent* vessels; thus preventing poisonous substances mixing with the blood.

Ida. I have noticed that the cuticle sometimes appears transparent, at other times dark-colored; what is the cause of the different appearances?

Mrs. G. The cuticle, when free from impurities, is transparent; but when dust and other foul matter be-

come mixed with its external scales, it becomes thick and less clear.

Fig. 55.

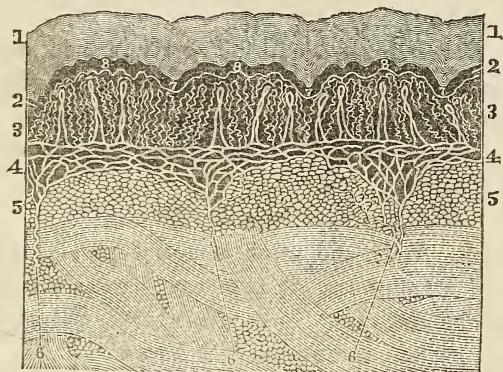


Fig. 55. 1, 1, The cuticle. 2, 2, The colored layer of the cuticle. 3, 3, The papillary layer. 4, 4, The net-work of nerves. 5, 5, The true skin. 6, 6, 6, Three nerves that divide, to form the net-work (4, 4). 7, 7, 7, The furrows between the papillæ. 8, 8, 8, Three papillæ, magnified fifty diameters.

Ida. How can these colored scales be removed?

Mrs. G. Soap will soften these scales; and, when this is effected, apply water and friction.

Ida. Is there danger of using too much soap?

Mrs. G. When we use strong soap, and allow it to remain, the skin becomes shrivelled. A moderate quantity of soap only should be used in bathing the skin.

Ida. What causes the skin to shrink, when too much soap is used?

Mrs. G. There are found in the cutis many small bodies called *oil-glands*. The minute tubes from these glands convey the oily product to the surface of the cuticle. When the matter in the oil-tubes is

removed by the action of the soap, it causes the skin to shrink.

Ida. At 2, 2, fig. 55, it speaks of a colored layer of the cuticle.

Mrs. G. It is true. In the newly-formed layers of the cuticle, the little cells are filled with a peculiar kind of paint. In the African, this paint is black; in the Indian, copper-colored; in the European, this coloring matter is slight.

Ida. Will you now describe the cutis?

Mrs. G. It is the most essential part of the two layers of membrane. It contains several sets of vessels, as the *Arteries*, *Veins*, *Absorbents*, *Oil* and *Per-spiratory* glands and ducts, and *Nerves*.

Fig. 56.

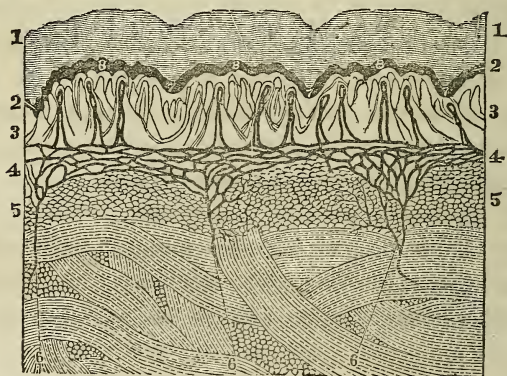


Fig. 56. 1, 1, The cuticle. 2, 2, The colored layer of the cuticle. 3, 3, The papillary layer. 4, 4, The net-work of capillary vessels. 5, 5, The true skin. 6, 6, 6, Three arteries, that divide to form the capillary vessels. 7, 7, 7, The furrows between the papillæ. 8, 8, 8, Three clusters of papillæ, magnified fifty diameters.

Ida. What are the papillæ, represented by 7, 7, 7, fig. 55, and 8, 8, 8, fig. 54?

Mrs. G. They are small conical elevations, containing some filaments of nerves and minute arteries. When the skin is suddenly chilled, they appear quite prominent, and are called by some people "goose flesh."

Ida. Are the blood-vessels numerous in the skin?

Mrs. G. They are. The minute arteries and veins form a net-work upon the surface of the cutis. Hence, wound any part of the skin, and it will bleed.

Ida. Are the nerves also numerous on the surface of the skin?

Mrs. G. They are; as we cannot cut or prick any portion of it without feeling pain.

Ida. From what is the oil made in the oil-glands?

Mrs. G. From the blood, by the action of the oil-glands. These are most active, when the skin is kept warm and clean.

Ida. Where does the perspiration, or sweat, proceed from?

Mrs. G. It is separated from the blood by small glands, called *perspiratory*. The ducts from these glands open obliquely upon the cuticle.

Ida. What is the use of these glands?

Mrs. G. By the action of these organs, from twenty to forty ounces of waste, useless matter is thrown out of the system every twenty-four hours.

Ida. Where does this waste matter come from?

Mrs. G. It proceeds from the bones, muscles, fat, and other parts of the body.

Ida. If the bones and other parts of the body lose so many ounces of matter every day, why do we not become emaciated?

Mrs. G. Because this decayed waste matter is replaced by newly-prepared atoms from the blood.

Fig. 57.

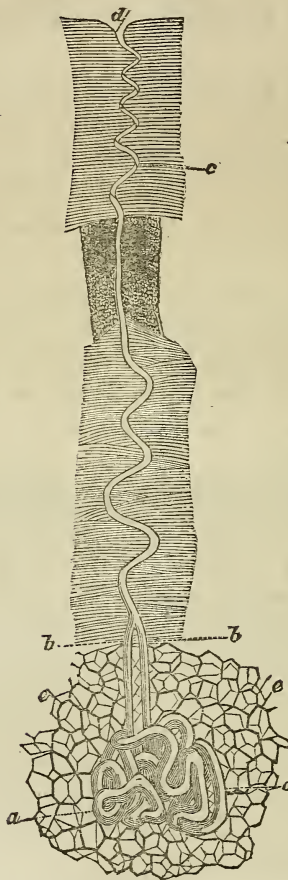


Fig. 57 represents a perspiratory gland from the palm of the hand, magnified forty diameters. *a, a*, A twisted tube, composing the gland; *b, b*, Two excretory ducts from the gland. These unite, to form one spiral tube, that perforates the cuticle (*c*), and opens obliquely on its surface at *d*. The gland is embedded in fat vesicles, which are seen at *e, e*.

Thus, there is a constant decay and renewal of the system.

Fig. 58.

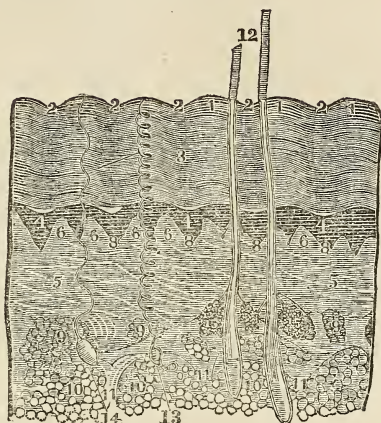


Fig. 58. 1, 1, The salient lines, or ridges, cut perpendicularly. 2, 2, 2, 2, 2, The furrows or wrinkles of the same. 3, The cuticle. 4, 4, The colored layer of the cuticle. 5, 5, The cutis vera. 6, 6, 6, 6, 6, The papillæ, each of which answers to the lines on the external surface of the skin. 7, 7, Small furrows between the papillæ. 8, 8, 8, 8, The deeper furrows between each couple of the papillæ. 9, 9, Cells filled with fat. 10, 10, 10, The adipose layer, with numerous fat vesicles. 11, 11, 11, Cellular fibres of the adipose tissue. 12, Two hairs. 13, A perspiratory gland, with its spiral duct. 14, Another perspiratory gland, with a duct less spiral. 15, 15, Oil-glands, with ducts opening into the sheath of the hair (12).

Ida. If these glands should become inactive, or their tubes closed, what would become of this waste matter?

Mrs. G. It would be retained in the system, if not carried off by other organs, which is often the case.

Ida. Would it be injurious to have the waste matter retained in the system?

Mrs. G. Certainly, very injurious: colds, and diseases of different kinds, are thus produced.

Ida. How can these vessels be kept in an active state?

Mrs. G. By frequent bathing, or washing the whole surface of the body; and, to prevent chills on the skin, by a sufficient amount of clothing.

Ida. I have noticed, when I bathe the whole surface of the skin daily, that I feel warmer; why is it?

Mrs. G. By bathing, the dust and perspiratory matter upon the cuticle are removed from the outlets or pores of the skin, which increases the action of the perspiratory vessels; consequently more heat is produced in the body.

Ida. I thought that perspiration was either absorbed by the clothing, or passed off into the air by evaporation?

Mrs. G. The watery portion of it passes off into the air; but the solid part of the perspiration, as the salt, oxide of iron, and oil, will remain upon the skin, unless removed by bathing and friction.

Ida. How often should the whole body be bathed?

Mrs. G. Every day, or at least every other day. Care should be taken to wipe the skin dry.

Ida. Is there not danger of taking cold, by bathing in cold weather?

Mrs. G. No; if you wet but a small part of the skin at a time, wipe dry, and rub smartly with a crash towel, until a glow of heat is felt on the skin.

Ida. What time is best for bathing?

Mrs. G. The morning, perhaps, is the most favorable time for ablution, because the system becomes somewhat exhausted during the day. This condition is not favorable to re-action and warmth of the skin.

Ida. Is it important what kind of clothing we wear?

Mrs. G. It is; that cloth which retains the moisture in its meshes is not so well adapted to the health of the skin and system, as those articles of an opposite character.

Ida. What kinds are best?

Mrs. G. Woollen is better than cotton; and silk, when thick, than linen; and for this reason, that the former retains more air in its meshes than the latter.

Ida. I have observed, that, when I put on clean hose, my feet were warmer: is it because the meshes contain more air?

Mrs. G. Precisely so: when we have worn our clothing a few days, the waste matter, which is constantly thrown out of the skin, coats or covers the meshes and fibres of the cloth. In chilly or cold weather, the under garments should be frequently changed.

Ida. Why is it that I feel more chilly when I leave the school, or lecture-room, than when I enter them?

Mrs. G. There are three reasons:—1st, The circulation of blood lessens, while sitting, and with it the production of heat; 2d, The skin usually becomes moist from perspiration; 3d, The warmth of the room renders the skin more impressible to cold. Hence, we need an extra garment when passing from the school-room or church.

Ida. If the hands or feet become frozen, or frost-bitten, what is necessary to be done?

Mrs. G. The parts should have cold water, or snow, applied to them. The person should be kept in

a cool room, and not suffered to go near the fire ; to this, add moderate friction to the chilled parts, and give internally some stimulating tea, — as ginger or peppermint. If the frozen parts blister, treat them as you would burns.

Ida. How should burns be treated ?

Mrs. G. 1. When the nerves are simply irritated, and the blood-vessels distended with blood, attended with severe smarting pain, applications should be applied, to prevent blistering ; as blisters are produced by an increased action of the arteries of the skin, which action deposits water under the cuticle. If this state of the arteries be prevented or suppressed, blisters will not follow. To prevent or suppress this state of arterial action, wet some folds of cotton or woollen cloth with cold water, and apply them to the parts scalded ; continue to apply cold water, in order to maintain the low temperature of the applications, as long as the *smarting pain* is experienced. The steady application of cold dressing tends to prevent an increased action of the blood-vessels, and will suppress it, if it already exist.

2. When blisters are formed, the cuticle is separated from the other tissues of the skin, by the effusion of water. In all cases, if the cuticle be not removed, a small opening should be made in the raised cuticle, by which the water deposited may be removed. Under such circumstances, never remove the cuticle, as it makes the best possible covering for the blood-vessels and nerves of the true skin. The cold water dressing, recommended above, may then be applied, as long as the smarting continues. After the pain has subsided,

the blistered part may be covered by a patch of cotton or linen cloth, upon which a cerate or ointment, made of lard and bees-wax, has been spread.

3. If the cuticle has been removed, there will be much suffering, because the nerves are unduly stimulated by the air. The cuticle is the sheath or covering of the vessels and nerves of the skin: when it is removed, a *substitute* should be applied. This substitute should be soothing, and cover the denuded surface. Linseed-meal or ground slippery-elm-bark poultice would make a good dressing; so would fresh cream, or lard and bees-wax, spread upon linen or cotton cloth. When dressings are applied, they should not be removed until they become dry and irritating. If there be much suffering, administer to an adult from twenty-five to sixty drops of laudanum, according to the severity of the pain. If the patient be a child, from fifteen drops to a tea-spoonful of paregoric may be administered. When there is much prostration, some hot peppermint tea may be found necessary to bring on reaction.

It is unnecessary to apply any article, "to take out the fire," as none remains in a burn or scald. Applications "to heal" the denuded surface are equally uncalled for, as a new cuticle is formed by the action of the vessels of the true skin.

CHAPTER IX.

THE FIVE SENSES.

Mrs. G. Having given you some idea of the shape, structure, and use of some of the most important parts of the body, we will now examine those which are subservient to the senses.

Ida. I think the senses are *touch, taste, smell, hearing, and seeing, or vision.*

Mrs. G. You are correct. By these senses, we perceive or know of the existence of objects.

SENSE OF TOUCH.

Ida. Pray, define touch.

Mrs. G. This sense enables us to tell whether a thing is rough or smooth, cold or hot, sharp or blunt.

Ida. Are not the fingers the means by which we know these differences in bodies?

Mrs. G. They are: the fineness of the skin, and the cushion of fat at their ends, make them well adapted to the execution of this sense.

SENSE OF TASTE.

Ida. What is taste?

Mrs. G. It is the sense by which we know the relish of a thing.

Ida. The tongue, then, is the organ of taste?

Fig. 59.

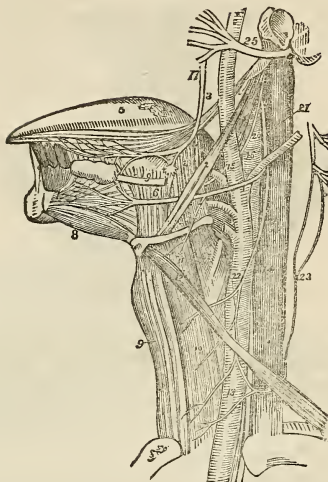


Fig. 59 gives a view of one side of the neck, showing the nerves of the tongue. 1, A fragment of the temporal bone, containing the meatus auditorius externus, mastoid and styloid processes. 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, Indicate the position of several small muscles. 5, The tongue. 13, The common carotid artery. 14, The internal jugular vein. 15, The external carotid. 16, The internal carotid. 17, The gustatory nerve, giving off a branch to the submaxillary ganglion (18), and communicating a little further on with the hypo-glossal nerve. 19, The submaxillary or Wharton's duct. 20, The glosso-pharyngeal nerve. 21, The hypo-glossal nerve, curving around the occipital artery. 22, The descendens noni nerve, forming a loop with the communicans noni (23), which is seen arising by filaments from the upper cervical nerves. 24, The pneumo-gastric nerve, emerging from between the internal jugular vein and common carotid artery, and entering the chest. 25, The facial nerve, emerging from the stylo-mastoid foramen, and crossing the external carotid artery.

Mrs. G. It is; though the lips, internal surface of the cheeks, palate, and upper part of the throat, share in this function.

Ida. Does eating chalk, pencils, and tobacco, injure the taste?

Mrs. G. They do; and cause poor health.

SENSE OF SMELL.

Ida. Please define smell.

Fig. 60.

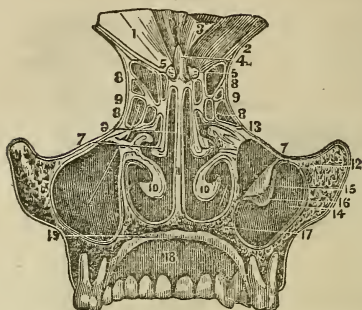


Fig. 60 represents a vertical section of the middle part of the nasal cavities, giving a posterior view of the arrangement of the ethmoidal cells. 1, The anterior fossa of the cranium. 2, The same, covered by the dura mater. 3, The dura mater turned up. 4, The crista galli of the ethmoid bone. 5, Its cribriform plate. 6, Its nasal plate. 7, The middle spongy bones. 8, The ethmoidal cells. 9, The os planum. 10, The inferior spongy bone. 11, The vomer. 12, The upper jaw. 13, Its union with the ethmoid. 14, The anterior walls of the antrum of the upper jaw, covered by its membrane. 15, Its fibrous layer. 16, Its mucous surface. 17, The palatine process of the upper jaw-bone. 18, The roof of the mouth covered by mucous membrane. 19, A section of this membrane. A bristle is seen in the orifice of the antrum of the upper jaw.

Mrs. G. It is the sense by which we know the odor or scent of a thing.

Ida. Where is this sense situated?

Mrs. G. In the passages of the nose, called the *nasal fossæ*, or nostrils.

Ida. What are the nasal fossæ?

Mrs. G. They are two irregular cavities, extending from the openings of the nose to the *pharynx*, or upper part of the *œsophagus*. The walls of these cavities are lined by mucous membrane. The olfactory, or first pair of cranial nerves, and a branch of the fifth pair, spread over this membrane.

Ida. How is the odor of any thing perceived?

Mrs. G. During the act of inspiration, or breathing, the air rushes through the nostrils, and the odorous

particles of substances contained in the air are brought in contact with the filaments of the nerves that are spread over the mucous membrane. The impressions made upon these nerves are transmitted to the brain.

Fig. 61.



Fig. 60 represents the first pair or olfactory nerves, with the nasal branches of the fifth pair. 1, The frontal sinus. 2, The sphenoidal sinus. 3, The hard palate. 4, The bulb of the olfactory. 5, Branches of the olfactory nerve on the superior and middle turbinated bones. 6, The sphenopalatine nerve from the second branch of the fifth pair. 7, The internal nasal nerve from the first branch of the fifth pair. 8, Branches of the nerve (7), to the lining membrane of the nose. 9, The ganglion of Cloquet in the foramen incisivum. 10, The anastomosis of the branches of the fifth pair on the inferior turbinated bones.

Ida. On what does the acuteness of smell depend?

Mrs. G. It is necessary that the brain, and nerves of smell, be in a state of health, and the mucous membrane that lines the nostrils be thin, and moistened with mucus.

Ida. What will injure the sense of smell?

Mrs. G. Snuff, and other irritants.

Ida. How?

Mrs. G. By diminishing the sensitiveness of the nerves, and by thickening and otherwise injuring the structure of the mucous membrane.

Ida. Can the sense of smell be improved?

Mrs. G. It can; like that of taste and touch.

Ida. Does this sense vary in the inferior animals, as well as in different persons?

Mrs. G. It does. In some animals, as the hound, and in some birds, as the vulture, this sense is remarkably acute.

SENSE OF HEARING.

Ida. This sense must be situated in the ear; but I cannot think that a description of this organ will be interesting.

Mrs. G. You mistake, *Ida*; the ear is one of the most complicated and beautiful organs in its structure, in the system. Anatomists divide it into three parts: 1st, the *external* ear; 2d, the *middle* ear, or *tympanum*; 3d, the *internal* ear, or *labyrinth*.

Fig. 62.

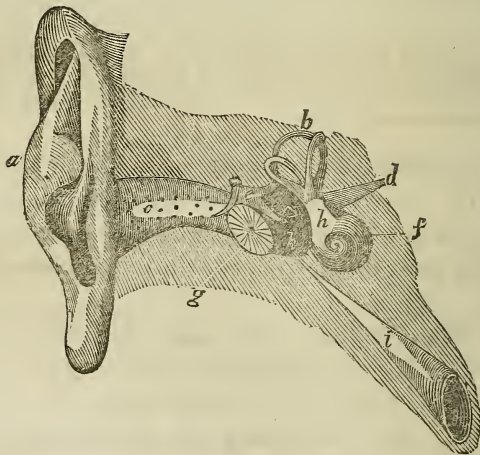


Fig. 62 represents the pinna, meatus, membrana tympani, ossicula audita, and semicircular canals. *a*, The pinna. *c*, The meatus auditorius. *g*, The membrana tympani. *k*, The tympanum. *e*, The ossicula audita. *b*, The semi-circular canals. *f*, The cochlea. *h*, The vestibule. *i*, The Eustachian tube. *d*, The auditory nerve.

Ida. Please describe the external ear.

Mrs. G. It is cartilaginous, presenting many ridges and furrows, arising from the folds of the cartilage that forms it. This part is called the *pinna*. The *meatus auditorius*, or external auditory canal, is a species of tube, which extends inwards from the pinna to the tympanum, or middle ear.

Ida. At g, fig. 62, the *membrana tympani* is represented; what is it?

Mrs. G. It is a thin, semi-transparent membrane, or skin, stretched across the external auditory canal, separating the external from the middle ear. This membrane is called by many persons the "drum of the ear," because it is stretched over the tympanum, like parchment over the head of a drum.

Ida. Will you describe the tympanum, or middle ear?

Mrs. G. It is an irregular bony cavity, and lies between the external auditory canal and internal ear. It contains four small bones, *ossicula audita*, (Fig. 62, e.) These are called, separately, the *malleus*, *incus*, *stapes*, and *orbiculare*.

Ida. Why is it, when I close my mouth and nostrils, and try to expel the air from my lungs, that I feel a pressure in my ear?

Mrs. G. There is a canal that extends from the back part of the nasal cavity to the middle ear, through which the air from the lungs passes. This canal is called the *Eustachian tube*.

Ida. Will you describe the internal ear, or labyrinth?

Mrs. G. It is called the *labyrinth*, from its complexity, or many windings. It is divided into *vestibule*, *semi-circular canals*, and *cochlea*.

Fig. 63.

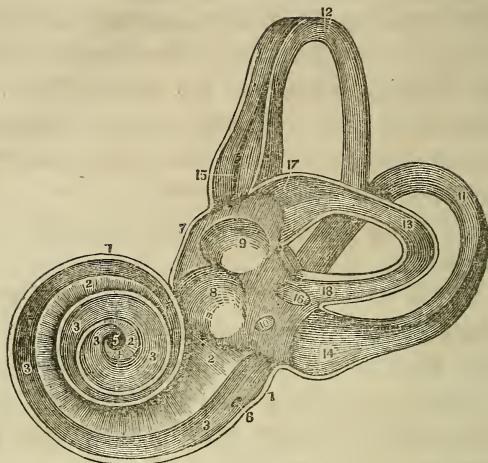


Fig. 63. A view of the labyrinth of the left ear, laid open in its whole extent, so as to show its structure. This figure is highly magnified.

1, 1, The thickness of the outer covering of the cochlea. 2, 2, 2, The scala vestibuli, or upper layer of the lamina spiralis. 4, The hamulus cochleæ. 5, The centre of the infundibulum. 6, The foramen rotundum, communicating with the tympanum. 7, The thickness of the outer layer of the vestibule. 8, The foramen rotundum. 9, The fenestra ovalis. 10, The orifice of the aqueduct of the vestibule. 11, The inferior semi-circular canal. 12, The superior semi-circular canal. 13, The external semi-circular canal. 14, The ampulla of the inferior canal. 15, The ampulla of the superior canal. 16, The common orifice of the superior and inferior canals. 17, The ampulla of the external canal.

Ida. What is the vestibule?

Mrs. G. It is a three-cornered cavity, situated immediately within the external wall of the labyrinth.

Ida. What are the semi-circular canals?

Mrs. G. They are three bony passages that communicate with the vestibule.

Ida. What is the cochlea?

Mrs. G. It consists of a bony and gradually tapering canal, about an inch and a half in length, which makes two turns and a half spirally around a central axis. It communicates with the vestibule.

Fig. 64.

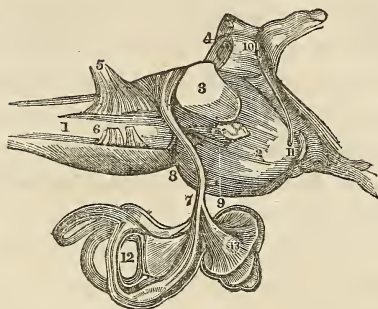


Fig. 64. A view of the origin and distribution of the portio mollis of the seventh pair, or auditory nerve. 1, The medulla oblongata. 2, The pons varolii. 3, 4, The crura cerebelli of the right side. 5, The eighth pair of nerves. 6, The ninth pair. 7, The auditory nerve, seen dividing into two branches, one of which is distributed in the vestibule and semi-circular canals (12), and the other in the cochlea (13). 8, The sixth pair of nerves. 9, The facial nerve of the seventh pair. 10, The fourth pair. 11, The fifth pair.

Ida. Will you explain how the nerve of hearing is distributed in this complex organ?

Mrs. G. This nerve, after passing from the brain, divides into two branches. These enter the structure of the membrane that lines the internal ear, and spread in all directions, upon the inner surface of the membrane, where they terminate in minute points.

Ida. How is sound conveyed to the brain?

Mrs. G. A certain influence, not well understood, called *sound*, operating generally through the medium of the air, which is compared to waves or vibrations, is collected by the external ear, and conducted into the meatus auditorius (1). This strikes upon and puts in vibration or motion the membrana tympani, or drum of the ear (2). The vibration of the membrana tympani is communicated to the malleus (3), that lies in contact with it. The bone (3) is bound to the bone (4).

The bone (4) to the bone (5). The bone (5) communicates with the vestibule of the internal ear (7). The vibration is conveyed from the drum of the ear to the cavity of the internal ear, by the chain of bones and the air in the middle ear. The vibration which is communicated to the fluid of the labyrinth, is thus impressed upon the delicate expansion of the auditory nerve, which transmits it to the brain.

Fig. 65.

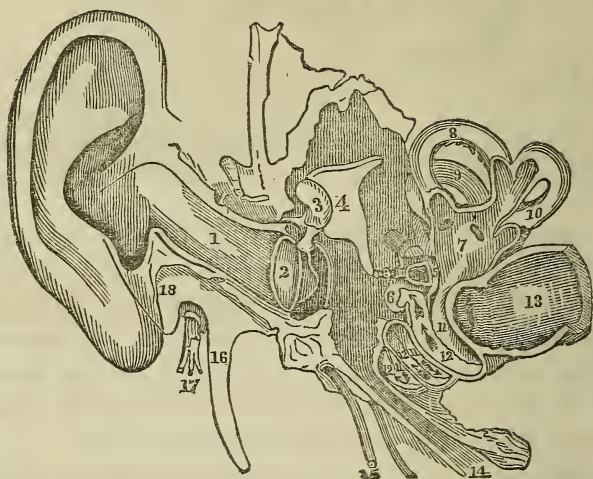


Fig. 65. A view of all parts of the ear. 1, The meatus auditorius. 2, The membrana tympani. 3, The malleus bone. 4, The incus bone. 5, The stapes, which is placed in the foramen ovalis, an opening into the vestibule (7). 6, The foramen rotundum. 8, 9, 10, The semi-circular canals, that open into the vestibule (7). 11, 11, 11, The scala, or canal of the cochlea, that opens into the vestibule of the internal ear. 12, 12, 12, The scala, or canal of the cochlea, that connects with the middle ear, through the foramen rotundum (6). 13, The meatus auditorius internus. 14, The Eustachian tube. 15, The chorda tympani. 16, The styloid process of the temporal bone. 17, The portio dura of the seventh pair of nerves. 18, The mastoid process.

1, 2, Are parts of the external ear. 3, 4, 5, The small bones placed in the middle ear. 7, 8, 9, 10, 11, 12, 13, are parts of the middle ear.

NOTE.— With fig. 65 before the pupil, let him describe the different parts of the ear, and their agency in hearing.

Ida. What causes deafness ?

Mrs. G. If the external auditory canal be closed, hearing will be destroyed. If the Eustachian tube, the labyrinth, or auditory nerve, be diseased or destroyed, it will impair or destroy hearing. The most common cause of defective hearing is a thickening of the membrana tympani, or an accumulation of viscid wax upon its exterior surface. The thickening of the membrane is usually the result of inflammation. The accumulated viscid wax can be removed, by softening it with oil dropped into the ear, followed by injections of warm soap suds. The heads of pins should never be put into the ear, as they frequently cause inflammation.

SENSE OF SEEING.

Mrs. G. The organ by which we perceive the form, color, and position of objects that surround us, is the eye.

Ida. What is the form of the eye ?

Mrs. G. The form of the eye is that of a sphere, of about one inch in diameter.

Ida. Of what is the eye-ball composed ?

Mrs. G. It is composed of three coats, and three humors.

Ida. What is the name of the coats ?

Mrs. G. They are, 1st, The *sclerotic* and *cornea* ; 2d, The *choroid*, *iris*, and *ciliary* processes ; 3d, The *retina*.

Ida. What is the structure of the sclerotic coat ?

Mrs. G. It is white and opaque. This part is

called by many persons the "white of the eye." This coat surrounds four-fifths of the ball of the eye.

Fig. 66.

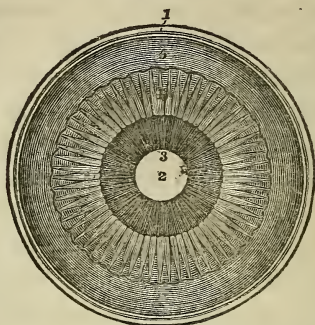


Fig. 66 represents the anterior segment of a transverse section of the globe of the eye, seen from within. 1, The divided edge of the three coats: —sclerotic, choroid, and retina. 2, The pupil. 3, The iris; the surface presented to view in this section being the uvea. 4, The ciliary processes. 5, The scalloped anterior border of the retina.

Ida. What is the cornea?

Mrs. G. It is a transparent protecting layer, that forms the front fifth of the eye. Its form resembles a watch-glass.

Ida. Where is the choroid coat situated?

Mrs. G. It is connected externally to the sclerotic coat, and internally it is in contact with the retina. The external surface of this coat is a rich chocolate brown color; the internal of a deep black, forming a delicate membrane, called *pigmentum nigrum*.

Ida. In what part of the eye-ball are the iris and ciliary processes?

Mrs. G. The iris is a short distance behind the cornea. Its centre is pierced by an opening called the pupil, or "sight of the eye." The ciliary processes, about sixty in number, are situated around the pupil.

They are formed by the plaiting of the internal layer of the choroid coat.

Ida. What is the retina?

Mrs. G. It is an expansion of the *optic nerve*, which comes from the brain, and enters the back part of the eye.

Fig. 67.

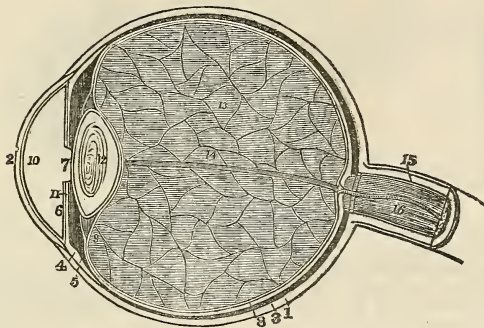


Fig. 67 represents a longitudinal section of the globe of the eye. 1, The sclerotic coat, thicker behind than in front. 2, The cornea, received within the anterior margin of the sclerotic, and connected with it by means of a bevelled edge. 3, The choroid coat, connected anteriorly with the ciliary ligament (4), and the ciliary processes (5). 6, The iris. 7, The pupil. 8, The third layer of the eye, the retina terminating anteriorly by an abrupt border, at the commencement of the ciliary processes. 9, The canal of Petit, which encircles the lens (12). The thin layer in front of this canal is the zonula ciliaris, a prolongation of the vascular layer to the retina. 10, The anterior chamber of the eye, containing the aqueous humor: the lining membrane by which the humor is secreted, is represented in the diagram. 11, The posterior chamber. 12, The crystalline lens, more convex behind than before, and inclosed in its proper capsule. 13, The vitreous humor, inclosed in the hyaloid membrane, and in cells formed in its interior by that membrane. 14, A tubular sheath of the hyaloid membrane, which serves for the passage of the artery of the capsule of the lens. 15, The neurilema of the optic nerve. 16, The arteria centralis retinae, embedded in its centre.

Ida. By what names are the humors of the eye called?

Mrs. G. *Aqueous, Crystalline, and Vitreous.*

Ida. Where are these humors situated?

Mrs. G. The aqueous is a transparent liquid, situated between the cornea and iris ; the crystalline humor, or *lens*, is transparent, and globular in form ; it is situated immediately behind the iris and pupil ; the vitreous is more dense than the aqueous, it forms the principal part of the eye-ball.

Fig. 68.

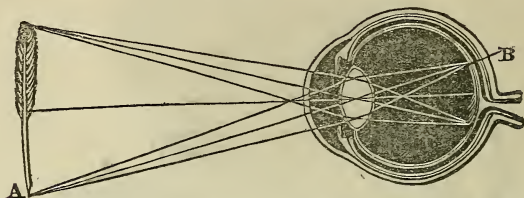


Fig. 68. A represents an arrow, an inverted image of which is painted on the retina of the eye at B. The image of all objects, upon the expansion of the optic nerve, is inverted by the crossing of the rays of light from objects, as they traverse the pupil.

Ida. How do we see objects, or where is the image of objects formed ?

Mrs. G. The picture of an object is painted on the retina, or back part of the eye. The different transparent parts, through which the luminous rays pass from the cornea to the retina, have the effect of collecting the rays, and making the object more distinct on the retina. The optic nerve is the medium of communication between the eye and brain.

Ida. Why do some persons hold their books near the eye ?

Mrs. G. When the cornea and crystalline lens are too convex, the rays of light are concentrated with too much force : hence objects can only be seen at a short distance.

Ida. Why do elderly persons hold their books at a greater distance from the eyes than young persons ?

Fig. 69.

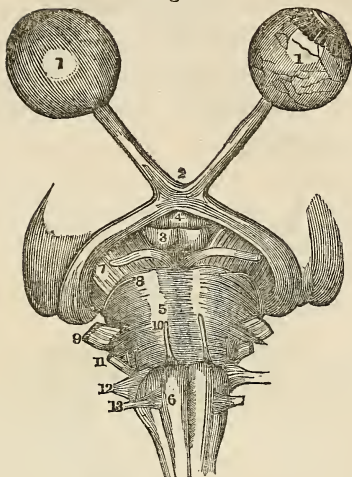


Fig. 69 represents the second pair of optic nerves, with the origin of seven other pairs. 1, 1, The globe of the eye. The one on the left hand is perfect; but that on the right has the sclerotic coat removed, to show the retina. 2, The crossing of the optic nerves. 3, The corpora albicantia. 4, The infundibulum. 5, The pons varolii. 6, The medulla oblongata. 7, The third pair of nerves. 8, The fourth pair. 9, The fifth pair. 10, The sixth pair. 11, The seventh pair. 12, The eighth pair. 13, The ninth pair.

Mrs. G. Because the cornea and crystalline lens become flattened, and the rays of light are not sufficiently concentrated.

Ida. How are these defects of the eye remedied?

Mrs. G. In the first instance, by making use of concave glasses; in the last, convex glasses.

Ida. How should we use our eyes, that we may have perfect vision for years?

Mrs. G. Never fix the eye on an object but a short time, before it is allowed to rest; or work in a very intense light but a few minutes, as a glare of light frequently causes blindness.

Ida. How are cross-eyes produced?

Mrs. G. If the eye be turned obliquely in viewing objects, it may produce an unnatural contraction of the muscles called into action. This contraction is called *strabismus*, or cross-eyes.

Fig. 70.

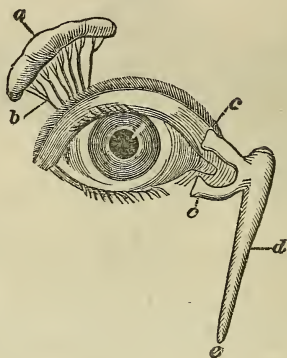


Fig. 70. *a*, Represents the lachrymal gland. *b*, Ducts leading from the lachrymal gland to the upper eyelid. *c, c*, The puncta lachrymalia. *d*, The nasal sac. *e*, The termination of the nasal duct.

Ida. What is the use of the lachrymal gland, represented at *a* in fig. 70?

Mrs. G. The tears are secreted in this gland, and flow to the eye through many minute ducts. From the eye they are conveyed, by two small ducts, to the nose. When there is a copious flow, as in weeping, these ducts do not convey the tears to the nose as fast as they are secreted; consequently they flow over the cheeks.

Ida. Of what use are the eye-brow and eye-lids?

Mrs. G. They are organs of protection, and serve to keep moisture and dust from the eye.

CHAPTER X.

REMOVAL OF DISEASE.

SICKNESS is generally the penalty for doing wrong, physically ; yet God has kindly provided for the relief of it. This provision consists in the power of the system to remove diseased actions. The energies of the constitution may be aided in their work of restoration, in two ways. 1st, By removing all the causes that tend to produce disease, or to continue it. 2d, By aiding and assisting the natural action of the system, in its efforts to remove disease.

The causes of disease have been pointed out in the previous chapters, to which the scholar is referred. The powers of the system may be assisted in their efforts to establish health, in the following manner :

1st. FOOD. Ordinarily, in all acute diseases, the patient does not desire food ; and, if it is taken and digested, the disease will be much increased, by the stimulation of the chyle, when converted into blood. If it is not digested, it will add to the prostration of the system, by the irritation of the mucous membrane of the digestive organs ; so that in *all instances* of acute disease, food should be withheld for some days,

while the thirst is allayed by cold water, barley-water, apple-water, crust coffee, &c.

When a patient is recovering from illness, the food should be given with regularity, and in quantities not so great as to oppress the system, and not too frequently. In all instances where a physician has been called, the food should be under his *special* direction, particularly after medicine is withdrawn, and the patient is recovering; as there are many examples of recurrence of disease, produced by injudicious use of food.

2d. BATHING. By the action of the oil and perspiratory glands of the skin, a great amount of injurious waste matter is removed from the system. In disease, these glands have their action much diminished. Their ducts also will become obstructed, if the residual products are suffered to remain upon the skin. This inaction and obstruction very much increases the oppression of the diseased organs. Consequently, removing this condition of the skin, by attending to *bathing* and friction, is a powerful means of restoring the system to such a condition, as will expedite a return to health.

3d. PURE AIR. This is not only essential in preventing, but it is of the utmost importance in removing disease. This arises from the fact, that, when the system is stimulated by pure blood, its power is greater to remove disease, than when the blood is defective in quality, by not having the carbon removed from it, by a proper supply of pure air. Hence, the custom of keeping the room of sick persons close, and the air impure, for fear the patient "will take cold," is exceed-

ingly pernicious. There is no question, but that disease, in many instances, becomes severe, dangerous, and even fatal, from the air of the patient's room being kept confined and impure, that would have been mild, and of short continuance, if the apartment of the person had been properly ventilated. Stoves, particularly the "air-tight," are among the greatest evils to which the sick in New England are subject.

4th. REST is absolutely necessary to a person suffering from disease. By this, I mean, not only a cessation of *muscular labor*, but of *mental action*. Consequently, when a person is indisposed, if only slightly, the brain should not be kept toiling and excited, by the noise and conversation of neighbors and friends. Conversation upon the details of business operations, and *exciting* and *important* topics, should be excluded from the room of the sick. To these rooms there should be no privileged topic, or set of visitors. These remarks apply as forcibly to the apartment of the *sick child*, as that of an adult. The more dangerous, and apparently the nearer death, is the sick person, the more rigorous should be the observance of the rule, to exclude all unnecessary visitors. The custom of visiting and conversing with sick friends, in the intervals of customary toil, particularly on the Sabbath, is a great evil. The habit is a gross nuisance, and will not be practised by any person who cares more for the welfare of a sick friend, than the gratification of a *sympathetic curiosity*.

5th. NURSES, and sometimes "watchers," are necessary, to carry out the suggestions under the preceding heads. A nurse should be kind, attentive, firm, and

cheerful, in presence of the patient. She needs both a theoretical and practical knowledge of the principles and practices upon which health and comfort depend. Without such knowledge, she will not act with uniform consistency, in discharging her duties to the sick. Woman is the natural nurse of the child, sister, brother, husband, father, and mother; hence, every girl should become familiar with the principles of *practical physiology*. It is an accomplishment indispensable to a complete female education, and more important than music and dancing.

A temporary "watcher" should have qualifications of a character similar to those described, as indispensable to the nurse. As persons taken from the field and shop usually are deficient in this respect, it would be much more humane and economical to employ and *pay* watchers, who are qualified by knowledge and *training*, to perform this duty in a faithful manner, while the kindness and sympathy of friends may be *practically* manifested by assisting to defray the expenses of these qualified and needful assistants.

6th. MEDICINE is sometimes necessary, to *assist* the natural powers of the system to remove disease; but it is only an *assistant*, and always an *evil*; yet it may induce an action that is less dangerous, than that of the disease for the relief of which it is given. While emetics are occasionally useful, in removing from the stomach food, and other articles that would cause disease, if suffered to remain, and cathartics are valuable, in some instances, to relieve the intestines of irritating residuum, yet the frequent administration of either would cause serious disease. The same re-

marks may be made relative to the use of opium, to relieve pain, and stimulating bitters, to create appetite.

Although medicine is useful in some instances, yet in a great proportion of the cases of disease, including fevers and inflammations of all kinds, attention to the laws of health will tend to relieve the system from disease, more certainly and speedily, and with less danger, than when medicines are administered. Thomas Jefferson, in writing to Dr. Wistar, of Philadelphia, said, "I would have the physician learn the limit of his art." I would say, have the matrons, and those who are continually advising "herb teas, pills, powders, bitters," and other "cure-alls," for any complaint labelled with some popular name, learn the limits of their duty, namely, attention to the laws of health. Future generations will look upon the administration of medicine, as now pursued, with as much astonishment and regret, as we view the habitual use of intoxicating drinks. The rule of every family, and each individual, should be, to touch not, taste not, of medicine of *any kind*, except when directed by a well-educated and honest physician, (sudden disease from accidents excepted).

POISONS AND THEIR ANTIDOTES.

Poisoning, either from accident or design, is of such frequency and danger, that it is of the greatest importance, that every person should know the proper mode of procedure in such cases, in order to render immediate assistance, when within their power.

Poisons are divided into two classes ; *mineral* (which will include the acids) and *vegetable*.

The first thing, usually, to be done, when it is ascertained that a poison has been swallowed, is to evacuate the stomach, unless vomiting takes place spontaneously. Emetics of the sulphate of zinc, (white vitriol,) or ipecacuanha, (ipecac,) or the wine of antimony, should be given.

When vomiting has commenced, it should be aided by large and frequent draughts of the following drinks: Flax-seed tea, gum-water, slippery elm tea, barley water, sugar and water, or any thing of a mucilaginous or diluent character.

MINERAL POISONS.

AMMONIA. — The *water of ammonia*, if taken in an over-dose, and in an undiluted state, acts as a violent corrosive poison.

The best and most effectual antidote is *vinegar*. It should be administered in water, without delay. It neutralizes the ammonia, and renders it inactive. Emetics should not be used in these cases.

ANTIMONY. — The *wine of antimony and tartar of emetic*, if taken in over-doses, cause distressing vomiting. In addition to the diluent mucilaginous drinks, give a tea-spoonful of the syrup of poppies, paregoric, or twenty drops of laudanum, every twenty minutes, until five or six doses have been taken, or the vomiting ceases.

The antidotes are *nut-galls* and *oak bark*, which may be administered in infusion.

ARSENIC. — When this has been taken, administer

an emetic of ipecac, speedily, in mucilaginous teas, and use the stomach-pump as soon as possible.

The antidote is the *hydrated peroxide of iron*. It should be kept constantly on hand at the apothecaries' shops. It may be given in any quantity, without injurious results.

COPPER. — The most common cause of poisoning from this metal, is through the careless use of cooking utensils, made of it, on which the *acetate of copper* (*verdigris*) has been allowed to form. When this has been taken, immediately induce vomiting, give mucilaginous drinks, or, what is still better, the *white of eggs*, diffused in water.

The antidote is the *carbonate of soda*, which should be administered without delay.

LEAD. — The *acetate (sugar) of lead* is the preparation of this metal, which is liable to be taken accidentally, in poisonous doses. Induce immediate vomiting, by emetics and diluent drinks.

The antidote is diluted *sulphuric acid*. When this acid is not to be obtained, either the sulphate of magnesia, (epsom salts,) or the sulphate of soda, (glauber's salts,) will answer every purpose.

MERCURY. — The preparation of this mineral, by which poisoning is commonly produced, is *corrosive sublimate*. The mode of treatment to be pursued, when this poison has been swallowed, is as follows: The *whites of a dozen eggs* should be beaten in two quarts of cold water, and a tumbler-full given every two minutes, to induce vomiting. When the whites of eggs are not to be obtained, soap and water should

be mixed with wheat flour, and given in copious draughts, and the stomach-pump introduced as soon as possible. Emetics, or irritating substances, ought not to be given.

NITRE. — *Saltpetre*. This, in over-doses, produces violent poisonous symptoms. Vomiting should be immediately induced, by large doses of mucilaginous diluent drinks ; but emetics, which irritate the stomach, ought not to be given.

ZINC. — Poisoning is sometimes caused by the *sulphate of zinc*, (white vitriol.) When this takes place, vomiting should be induced, and aided by large draughts of mucilaginous and diluent drinks. Use the stomach pump as soon as possible.

The antidote is the *carbonate* or *super-carbonate of soda*.

NITRIC, (aqua fortis,) MURIATIC, (marine acid,) or SULPHURIC (oil of vitriol,) ACIDS, may be taken by accident, and produce poisonous effects.

The antidote is *calcined magnesia*, which should be freely administered, to neutralize the acid and induce vomiting. When magnesia cannot be obtained, the *carbonate of soda* or *potash* may be given. *Chalk*, powdered and given in solution, or strong *soap suds*, will answer a good purpose, when the others are not at hand. It is of very great importance that something be given speedily, to neutralize the acid. One of the substances above named should be taken freely, in diluent and mucilaginous drinks, as gum-water, milk, flax-seed, or slippery-elm tea. Emetics ought to be avoided.

OXALIC ACID. — This acid resembles the sulphate of magnesia, (epsom salts,) which renders it liable to be taken, by mistake, in poisonous doses. Many accidents have occurred from this circumstance. They can easily be distinguished by tasting a small quantity. The *epsom salts*, when applied to the tongue, have a very bitter taste, while the *oxalic acid* is intensely sour.

The antidote is *magnesia*, between which and the acid a chemical action takes place, producing the oxalate of magnesia, which is inert. When magnesia is not at hand, *chalk*, *lime*, *carbonate of soda*, or *carbonate of potash*, (salæratuſ,) will answer as a substitute.

Give the antidote in some of the mucilaginous drinks before named. No time ought to be lost, but the stomach-pump should be introduced as soon as a surgeon can be obtained.

LEY. — The ley obtained by the leaching of ashes, may be taken by a child accidentally. The antidote is vinegar, or oil of any kind. The vinegar neutralizes the alkali, by uniting with it, forming the acetate of potash. The oil unites with the alkali, and forms soap, which is less caustic than the ley. Give, at the same time, large draughts of mucilaginous drinks, as flax-seed tea, &c.

VEGETABLE POISONS.

The vegetable poisons are quite as numerous, and many of them equally as violent, as any in the mine-

ral kingdom. We shall describe the most common, and which, therefore, are most liable to be taken.

OPIUM. — This is the article most frequently resorted to by those wishing to commit suicide, and, as it is used as a common medicine, is easily obtained. From this cause, also, mistakes are very liable to be made, and accidents to occur with it. Two of its preparations, *laudanum* and *paregoric*, are frequently mistaken for each other; the former being given when the latter is intended.

Morphia, in solution, or *morphine*, as it is more commonly called by the public, is a preparation of the drug under consideration, with which many cases of poisoning are produced. It is the active narcotic principle of the opium, and one grain is equal to six of this drug in its usual form.

When an over-dose of opium, or any of its preparations, has been swallowed, the stomach should be evacuated as speedily as possible. To effect this, as much tartar emetic as can be held on a ten-cent piece, or as much *ippecacuanha* as can be held on a twenty-five cent piece, should be dissolved in a tumbler of warm water, and one-half given at once, and the remainder in twenty-minutes, if the first has not, in the meantime, operated. In the interval, copious draughts of warm water, or warm sugar and water, should be drunk. The use of the stomach-pump, in these cases, is of the greatest importance, and should be resorted to without delay. After most of the poison has been evacuated from the stomach, a strong infusion of *coffee* ought to be given; or some one of the vegetable acids, such as *vinegar* or *lemon-juice*, should be administered.

The patient should be kept in motion, and salutary effects will often be produced by dashing a bucket of cold water on the head. *Artificial respiration* ought to be established, and kept up for some time. If the extremities are cold, apply warmth and friction to them. After the poison has been evacuated from the stomach, stimulants, as warm wine and water, or warm brandy and water, ought to be given, to keep up and sustain vital action.

STRAMMONIUM. — *Thorn-apple*. This is one of the most active narcotic poisons, and, when taken in over-doses, has in numerous instances caused death.

The treatment—similar to that recommended in poisoning from opium.

HYOSCIAMUS. — *Henbane*. This article, which is used as a medicine, if taken in improper doses, acts as a violent irritating and narcotic poison.

Treatment—Similar to that of poisoning from over doses of opium.

CONIUM. — *Hemlock*. Hemlock, improperly called by many *cicuta*, when taken in an over-dose, acts as a narcotic poison. It was by this narcotic that the Athenians used to destroy the lives of individuals condemned to death by their laws. Socrates is said to have been put to death by this poison.

When swallowed in over-doses, the treatment is similar to that of opium, strammonium, and henbane, when over-doses are taken.

BELLADONNA — *Deadly Night-shade*. CAMPHOR. ACONITE — *Monkshood, Wolfsbane*. BRYONY — *Bryonia*. DIGITALIS — *Foxglove*. DULCAMARA — *Bitter-*

sweet. GAMBOGE. LOBELIA — *Indian tobacco.* SANGUINARIA — *Blood-root.* OIL OF SAVIN. SPIGELIA — *Pink-root.* TOBACCO. STRYCHNINE — *Nox-vomica.* — All of these, when taken in over-doses, are poisons of greater or less activity. The treatment of poisoning, by the use of any of these articles, is similar to that pursued in over-doses of opium. (See *Opium*, page 100.)

In *all* cases of poisoning, call a physician as soon as possible.

GLOSSARY.

- Ab'do-men.* That part of the body which lies between the chest and the bottom of the pelvis. Fig. 24.
- Al-bu'men.* A substance which resembles the white of an egg.
- A-nas-to-mo'sis.* The opening of one vessel into another, as an artery into a vein; or the communication of two vessels.
- An-at'o-my.* The description of the structure of animals. The word anatomy properly signifies dissection.
- An'nu-lus.* Having the form of a ring.
- An-te'ri-or.* Before or in front in place.
- An'trum.* A cavity.
- A-ort'a.* The great artery that arises from the left ventricle of the heart. Fig. 39.
- A-rach'noid.* Resembling a spider's web. A membrane of the brain.
- Ar'bor.* A tree; *arbor vitæ*, the tree of life. Fig. 49.
- Ar-te'ri-a.* An artery; a tube through which blood flows from the heart.
- A-ryt'e'noid.* The name of a cartilage of the larynx. Fig. 31.
- As-phyx'ia.* Suspended animation. Now used for suspended respiration.
- As-trag'u-lus.* The name of a bone in the foot. Fig. 4.
- Aud-i'tion.* Hearing.
- Aud-i-to'ri-us.* Pertaining to the sense or organs of hearing.
- Au'ri-cle.* A cavity of the heart. Fig. 36.
- Ax'il-la-ry.* Belonging or relating to the arm pit. Fig. 40.
- Az'a-gos.* The name of a vein. Fig. 23.
- Bile.* A yellow, viscid fluid, secreted by the liver.
- Brach'i-al.* Belonging to the arm. Fig. 40.
- Brain.* That soft, whitish mass, inclosed within the skull bones.
- Bron'chus, chi.* A division of the trachea that passes to the lung. Fig. 25.
- Bron'chi-al.* Relating to the bronchi.
- Bron-chi'tis.* An inflammation of the bronchi.
- Cal'cis.* The heel bone.
- Cap'il-la-ry.* Hair-like, small.
- Cap'ut.* The head; *caput coli*, the head of the colon. Fig. 20.
- Car'bon.* Pure charcoal.
- Car-bon'ic.* Pertaining to carbon.
- Car'di-ac.* Relating to the heart; or upper orifice of the stomach. Fig. 20.
- Car'pal.* Relating to the wrist.
- Car'pus.* The wrist. Fig. 6.
- Car'ne-æ.* Fleshy.
- Ca-rot'id.* The great arteries of the neck, that convey blood to the head. Fig. 40.
- Car'ti-lage.* Gristle. A smooth, elastic substance, softer than bone.
- Cæ'cum.* Blind; the name given to the commencement of the colon. Fig. 20.

- Ca'va*. Hollow; *vena cava*, a name given to the two great veins of the body. Fig. 37.
- Cell'u-lar*. Composed of cells.
- Cer'e-bell'um*. The little brain; the lower and back portion of the brain. Fig. 49.
- Cer'e-brum*. The brain: the term is sometimes applied to the whole contents of the cranium; at others to the upper portion. Fig. 49.
- Cer'vix*. The neck.
- Cer'vi-cal*. Relating to the neck.
- Chest*. The trunk of the body from the neck to the abdomen. Fig. 24.
- Cho-led'o-chus Duct*. The duct which conveys the bile into the duodenum.
- Chor'dæ*. An assemblage of threads or fibres. Fig. 38.
- Cho'roid*. A term applied to several parts of the body that resemble the skin. Fig. 67.
- Chyle*. A nutritive fluid, of whitish appearance.
- Chyme*. A kind of grayish pulp, formed from the food after it has been for some time in the stomach.
- Cil'ia-ry*. Belonging to the eyelids.
- Clav'i-cle*. The collar bone.
- Coc'cyx*. An assemblage of bones joined to the sacrum.
- Coch'le-a*. A cavity of the ear, resembling a snail-shell. Fig. 63.
- Col'on*. A portion of the large intestines. Fig. 20.
- Co-lum'na, æ*. A column or pillar.
- Con'cave*. Hollow; as the inner surface of a spherical body.
- Con'vex*. Bilging; as the exterior surface of a spherical body.
- Corn'e-a*. The transparent membrane in the fore part of the eye. Fig. 67.
- Cor'n-u-a*. A horn; a prominence.
- Cor'o-nal*. Belonging to the crown, or top of the head. Fig. 1.
- Cor'po-ra Al-bi'can'ti-a*. A white body; the name of a part of the brain. Fig. 49.
- Cor'pus Cal-lo'sum*. A hard body; the name of a part of the brain. Fig. 49.
- Cos-ta'lis*. Belonging to the ribs. Fig. 25.
- Cra'ni-um*. The assemblage of bones which inclose the brain.
- Cri'coid*. A name given to a cartilage of the larynx. Fig. 30.
- Cu'nei-form*. The name of bones in the hand and foot. Fig. 4.
- Cu'ti-cle*. The external layer of the skin. Fig. 55.
- Cu'tis Ve'ra*. The internal layer of the skin. Fig. 58.
- Den'tal*. Pertaining to the teeth.
- De-scen'dens*. Descending; falling.
- Di'a-phragm*. The midriff; a muscle separating the chest from the abdomen. Fig. 24.
- Di-ges'tion*. The process of dissolving food in the stomach, and preparing it for circulation and nourishment.
- Dor'sal*. Pertaining to the back.
- Du-od'e-num*. The first of the small intestines, being about 12 fingers' breadth. Fig. 20.
- Du'ra*. Hard; as *dura mater*, the firm membrane of the brain. Fig. 48.
- En'si-form*. The name of a cartilage at the extremity of the sternum.
- Ep-i-glot'tis*. One of the cartilages of the larynx. Fig. 31.
- Eth'moid*. Sieve-like; a bone of the nose. Fig. 60.
- Eth-moi'dal*. Resembling a sieve.
- Eus-ta'chian Tube*. This tube is so called from its discoverer, Eustachius. Fig. 62.
- Ex-ter'nus*. External, outward.
- Fa'cial*. Pertaining to the face.
- Fem'o-ral*. Belonging to the thigh.
- Fe-nes'tra, um*. A window; an opening. Fig. 63.
- Fi'bre*. An organic filament or thread, of a solid consistence, which enters into the composition of every animal and vegetable texture.
- Fib'rin*. A peculiar organic compound substance found in animals and vegetables.

- Fib'u-la*. The outer and lesser bone of the leg. Fig. 8.
- Fib'u-lar*. Pertaining to the fibula.
- Fil'a-ment*. A fine thread, of which nerves, skin, &c. are composed.
- Fo-ra'men*. A hole.
- Fore-arm*. The part of the upper extremity between the arm and hand.
- Fos'sa*. A cavity in a bone, with a large aperture.
- Fræ'num*. A bridle. A name given to several membranous folds, which bridle or retain certain organs. Fig. 20.
- Function*. The action of an organ or system of organs.
- Gang'li-on, a*. A small circumscribed tumor, found in certain parts of the nervous system. Fig. 51.
- Gas'tric Juice*. A fluid of the stomach, which aids in the digestion of food.
- Gel'a-tin*. A concrete animal substance, soluble in water.
- Gland*. A distinct, soft body, formed by a great number of vessels rolled together, either constituting a part of the lymphatic system, or destined to secrete some fluid from the blood.
- Glos'sa*. The tongue. Names compounded with this word are applied to muscles attached to the tongue. Fig. 59.
- Glos'sa Phar-yn'ge-al*. The name of a nerve of the tongue and pharynx.
- Glott'is*. A narrow opening at the upper part of the larynx.
- Heart*. A muscular organ situated in the chest. Fig. 36.
- Hem'or-rhage*. A discharge of blood from any vessel.
- He-pat'ic*. Pertaining to the liver.
- Hu'mer-us*. The bone of the arm. Fig. 12.
- Hy'a-loid*. Resembling glass. The name of a membrane of the eye. Fig. 67.
- Hy'oid*. The bone at the root of the tongue.
- Hy'po-glos'sal*. Under the tongue. Fig. 59.
- Il'e-um*. A portion of the small intestines. Fig. 20.
- Il'i-ac*. Relating to the flanks. Fig. 40.
- Il'i-um*. The haunch bone. Fig. 9.
- In-ci'si-vum*. The name of an opening in the palate.
- Inf'ra Orb'i-tal*. Under the orbit of the eye. Fig. 50.
- In-fun-dib'u-lum*. Funnel-shaped.
- In-nom-i-na'ta*. Parts which have no proper name. Fig. 33.
- In'ter*. Between.
- In-ter-cos'tal*. Between the ribs.
- I'ris*. The membrane, or colored border around the pupil of the eye. Fig. 66.
- Je-ju'num*. A portion of the small intestines. Fig. 20.
- Ju'gu-lar*. Relating to the throat. The great veins of the neck. Fig. 25.
- Lab'y-rinth*. A place full of turnings; a cavity of the ear.
- Lach'ry-mal*. Pertaining to tears.
- Lac'te-al*. A vessel of animal bodies for conveying chyle from the intestines to the common reservoir. Fig. 23.
- Lamb-doi'dal*. The name of a suture formed by the parietal and occipital bones of the skull. Fig. 1.
- Lam'i-na, æ*. A plate, or thin piece of bone.
- Lar'ynx*. The upper part of the wind-pipe. Fig. 30.
- Lig'a-ment*. A strong, compact substance, serving to bind one bone to another.
- Lin'gual*. Pertaining to the tongue.
- Liv'er*. The largest gland in the system, situated in the abdomen. Fig. 20.
- Lobe*. A round, projecting part of an organ.
- Lum'bar*. Pertaining to the loins.
- Lungs*. The organs of respiration, situated in the chest. Fig. 25.

- Ma'lar.* Pertaining to the cheek bone. Fig. 2.
- Mal'le-us.* A bone of the ear. Fig. 65.
- Mas'toid.* The name of a process of the temporal bone behind the ear.
- Mas-toi'de-us.* The name of a muscle upon the neck that is attached to the mastoid process.
- Max'il-la-ry.* Pertaining to the jaw.
- Me'a'tus.* Passage, channel.
- Me'di-um.* The space or substance through which a body moves or passes.
- Me-di-as-ti'num.* A membrane that separates the chest into two parts. Fig. 25.
- Me-dull'a Ob-lon-ga'ta.* Commencement of the spinal cord. Fig. 49.
- Mem-br'a'na Tym-pa'ni.* A membrane; a thin, white, flexible skin, formed by fibres interwoven like net-work. Fig. 62.
- Mes'en-ter-y.* A membrane placed in the middle of the intestines, and to which they are attached.
- Mes-en-ter'ic.* Pertaining to the mesentery. Fig. 23.
- Met-a-carp'al.* Relating to the metacarpus. Fig. 7.
- Met-a-carp'us.* The part of the hand between the wrist and fingers. Fig. 7.
- Met-a-tar'sal.* Relating to the metatarsus.
- Met-a-tar'sus.* The instep. Seven bones of the foot. Fig. 5.
- Mid'riff.* See Diaphragm.
- Mit'ral.* The name of the valves of the left side of the heart. Fig. 37.
- Mo'tor, es.* A mover.
- Mu'cus.* A viscid fluid secreted by the mucous membrane, which it serves to moisten and defend.
- Mus'cle.* A bundle of fibres inclosed in a sheath.
- Mus'cu-lar.* Relating to a muscle.
- My'lo-Hy'oid.* The name of a muscle of the neck. Fig. 50.
- Na'sal.* Pertaining to the nose.
- Na-vic-u-la're.* The name of one of the tarsal bones. Fig. 5.
- Nerve.* An organ of sensation and motion in animals.
- Neu-ri-lem'a.* The sheath or covering of a nerve.
- Nitro-gen.* That element or component part of air which is called azote.
- Œ-soph'a-gus.* The name of the passage through which the food passes into the stomach. Fig. 20.
- Ol-fac'to-ry.* Pertaining to smelling. Fig. 61.
- Ol-i-va're.* The name of a portion of the spinal cord.
- O-men'tum.* The caul. Fig. 24.
- Oph-thal'mic.* Belonging to the eye. Fig. 50.
- Op'ti-cus, Op'tic.* Pertaining to the eye.
- Or'gan.* A part of the system destined to exercise some particular function.
- Or-gan'ic.* Pertaining to an organ.
- Os-sic'u-la Au-di'ta.* The four small bones in the ear. Fig. 62.
- O-va'le, is.* Round.
- Ox'y-gen.* The name of one of the elements of the atmosphere.
- Pa-la'tum.* The palate. The roof of the mouth. Fig. 21.
- Pan'cre-as.* The name of one of the digestive organs. Fig. 20.
- Pan-cre-at'ic.* Belonging to the pancreas.
- Pa-pill'a, æ.* Small conical prominences.
- Par-i-etal.* The name of a bone of the head. Fig. 2.
- Pa-rot'id.* The name of the largest salivary gland. Fig. 16.
- Pa-tell'a, æ.* The knee-pan.
- Pel'vic.* Relating to the pelvis.
- Pel'vis.* The basin formed by the large bones at the lower part of the abdomen.
- Per-i-card'i-um.* A membrane that incloses the heart. Fig. 24.
- Per-o-ne'al.* Relating or belonging to the fibula. Fig. 40.
- Per-spi-ra'tion.* The evacuation of

- the fluids of the body through the pores of the skin.
- Pha'ryn timer*. The upper part of the œsophagus. Fig. 22.
- Pha'lanx, ges*. Three rows of small bones, forming the fingers or toes. Fig. 7.
- Phys-i-ol'o-gy*. The science of the properties and functions of animals and plants.
- Pi-a Ma'ter*. A very delicate membrane which immediately covers the brain.
- Pig-mentum Nig'rum*. Pigment, coloring matter.
- Pin'na*. A wing; the name of a part of the ear.
- Pis'i-form*. One of the metacarpal bones. Fig. 6.
- Pla'num, i*. Plain, level, smooth.
- Pleu'ra, æ*. A thin membrane that covers the inside of the chest, and forms the exterior coat of the lungs. Fig. 25.
- Pneu-mo-gas'tric*. Belonging or relating to both the stomach and lungs.
- Pons Va-ro'li-i*. The name of a part of the brain. Fig. 52.
- Pos-te'ri-or*. The opposite of anterior, the back part.
- Pter'y-goid*. The name of a process on one of the skull bones.
- Pul-mo-na'ry*. Belonging to or relating to the lungs.
- Puncta Lach-ry-ma'lia*. The name of the openings through which the tears pass to the nose. Fig. 70.
- Py-lo'rus*. The lower orifice of the stomach with which the duodenum connects. Fig. 20.
- Py-ram-i-da'le*. A term applied to triangular eminences upon the medulla oblongata.
- Ra'di-us*. The name of one of the bones of the fore-arm. Fig. 6.
- Ra-di-a'lis*. Radial; belonging to the radius.
- Re-cep-tac'u-lum Chy-li*. A receptacle of the chyle.
- Rec'tum*. The third and last portion of the intestines. Fig. 20.
- Re'nal*. Pertaining to the reins or kidneys. Fig. 40.
- Res'ti-forme, ia*. The name applied to two projecting bodies upon the medulla oblongata.
- Re'ti-na*. The essential organ of sight. One of the coats of the eye. Fig. 69.
- Re-sid'u-um*. Residue. The waste remains of the food.
- Re-sid'u-al*. Remaining after a part is taken.
- Res'pi-ra-tion*. The act of breathing.
- Ro-tund'um, a*. Round.
- Ru'ga, æ*. Plaits, or wrinkles.
- Sa'crum*. The bone which forms the back part of the pelvis, and is a continuation of the vertebral column.
- Sa'cral*. Pertaining to the sacrum.
- Sag-it'tal*. The name of a suture that unites the parietal bones. Fig. 1.
- Sa-li'va*. The fluid secreted in the mouth.
- Sall'i-va-ry*. That which belongs to the saliva.
- Sa-ph'e'nous*. A name given to veins of the lower extremities. Fig. 54.
- Sca'la Ves'ti-bule*. The name of an opening in the internal ear.
- Sca'phoid*. A name given to several parts. Fig. 4.
- Sci-at'ic*. The name of the large nerve of the leg. Fig. 54.
- Scle-rot'ic*. A membrane of the eye. Fig. 67.
- Se'rum*. One of the constituents of the blood.
- Sig'moid*. Resembling the Greek ς .
- Si'nus*. A cavity, the interior of which is more expanded than the entrance.
- Skel'e-ton*. The aggregate of the hard parts of the body. The bones.
- Sphe'noid*. A bone of the skull.
- Sphe-noi'dal*. Pertaining to the sphenoid.
- Sphe'no Pal'a-tine*. Pertaining to the sphenoid bone and palate.

- Spinal Cord.* A prolongation of the brain. Fig. 52.
- Spine.* A thorn. The vertebral column.
- Spleen.* The milt. Fig. 20.
- Stratum, a.* A bed or layer.
- Styloid.* An epithet applied to processes that resemble a style or pen.
- Sub.* Under. A prefix to the names of several muscles.
- Sub-clavius.* A name applied to certain parts under the clavicle.
- Sub-lingual.* Under the tongue.
- Sub-maxillary.* Under the jaw.
- Suture.* The seam or joint which unites the bones of the skull. Fig. 1.
- System.* An assemblage of organs, composed of the same tissues, and intended for the same functions.
- Tarsal.* That which relates to the tarsus.
- Tarsus.* The posterior part of the foot. Fig. 5.
- Tendon, do.* A hard, insensible cord or bundle of fibres, by which a muscle is attached to a bone.
- Tendina, æ.* Pertaining to a tendon.
- Tentorium.* A process of the dura mater.
- Thoracic Duct.* The duct that conveys the chyle to the veins. Fig. 23.
- Thorax.* The chest. Fig. 25.
- Thyroid.* Resembling a shield. A cartilage of the larynx. Fig. 30.
- Tibia.* The large bone of the leg.
- Tibial.* Pertaining to the tibia.
- Tonsils.* A glandular body at the passage from the mouth to the pharynx. Fig. 20.
- Trachea.* The wind-pipe. Fig. 39.
- Triepizium.* A bone of the wrist. Fig. 6.
- Triangular.* Triangular valves of the heart. Fig. 37.
- Triquetra.* Small irregular bones of the skull. Fig. 1.
- Tumesculum.* A swelling or tumor on animal bodies.
- Tunica.* Pertaining to the tunic or membrane.
- Tympanum.* The middle ear. Fig. 62.
- Ulna.* A bone of the fore-arm. Fig. 6.
- Ulnar.* Pertaining to the ulna. Fig. 6.
- Unciform.* Hook-shaped. A bone of the wrist. Fig. 6.
- Uvea.* Resembling grapes. A thin membrane of the eye.
- Uvula.* A soft body, suspended from the palate, near the aperture of the nostrils, over the glottis. Fig. 22.
- Valve.* Any membrane, or doubling of any membrane, which prevents fluids from flowing back in the vessels and canals of the animal body.
- Valvula Conni-ventes.* The name of the wrinkles or folds on the inside of the small intestines.
- Vascular.* Abounding in vessels.
- Veins.* Vessels that convey blood to the heart.
- Venous.* Pertaining to veins.
- Ventricule.* A small cavity of the animal body.
- Vermiformis.* Having the form or shape of a worm. Fig. 20.
- Vertebra, æ.* A joint of the spinal column, or back-bone.
- Vertebral.* Pertaining to the joints of the spine.
- Vesicle.* A bladder-like cavity.
- Vestibule.* A cavity belonging to the ear. Fig. 63.
- Viscera.* The name applied to the internal organs of the system.
- Vitreous.* Pertaining to glass. A humor of the eye. Fig. 67.
- Vomer.* One of the bones of the nose. Fig. 2.
- Zonula.* A zone or belt.

(Physiology for Children) 2
(Cutter),

RECOMMENDATIONS.

376-45
SPRINGFIELD HIGH SCHOOL, MARCH, 1846.

DR. CUTTER,

Dear Sir, — I have adopted your work on Anatomy and Physiology as a Text-Book. Our Town School Committee were unanimous in favor of its introduction, and I am fully confident, that it will be found a judicious selection. I have heretofore used several kinds of text-books on this subject, which have been highly esteemed, and justly so, by teachers generally; but the superiority of this work is so obvious on every page, that I have not hesitated for a moment to give it the preference over all others.

Among its excellences will be found an unusually clear description of what is *essential*, free from useless *verbiage*. No work of the kind has ever been published, so full of illustrations, and these are remarkably adapted to render the subject clear to the comprehension of the pupil. While *technical* language is used, it is confined chiefly to particular description of plates, or topics independently, leaving the popular instruction so plain that a child can understand it.

As a Text-Book for schools, or a work adapted to general reading, I believe it will be found superior to anything that has ever yet been laid before the public.

A. PARISH,

Principal of the Springfield High School.

WESLEYAN ACADEMY, WILBRAHAM, MASS., FEB. 18th, 1846.

The undersigned having examined the Second Edition of Anatomy and Physiology, by Calvin Cutter, M. D., can cordially recommend that work to an intelligent and inquiring public. The subject treated of is one of vast importance to the world, and one not yet half appreciated. Were our teachers in academies and common schools fully acquainted with the structure of the human system, and the laws of health, they would be worth infinitely more to the community; and were fathers, and especially mothers, better instructed in the science and constitution of man, they could not fail to discharge with greater usefulness the great responsibilities resting upon them.

We heartily recommend Dr. Cutter's work to all who wish for more full information upon the subject of their own frame and organization.

ROBERT ALLYN,

Principal of Wesleyan Academy.

ISAAC T. GOODNOW,

Teacher of Natural Science.

BRIDGEWATER, FEB. 21st, 1846.

MY DEAR SIR,

During the first year that I had the charge of this Institution, two deservedly popular and able works on Physiology were adopted as text books. Very soon after Dr. Cutter's treatise on the same subject made its appearance, it was introduced into my school in place of those above-mentioned. I have had, therefore, a fair opportunity of judging of its adaptation as compared with other works, to the wants of our schools and academies. For the purposes of instruction, it appears to me that it is rendered superior to other treatises. 1st. Because it is adorned with a far greater number of Plates, which I find engages the attention and deeply interests the mind of the pupils — presenting to them striking ocular illustrations of the form and structure of the human system.

2d. Because its lucid arrangement and clear style, divested of technical terms as far as the subject will possibly permit, render it so intelligible, that scholars of sixteen years of age, and even younger minds, may comprehend it, and with some explanation from the teacher, may study it with advantage and delight.

3d. Because questions, deduced from the contents, with much discrimination, have been placed at the bottom of each page, to lead the *younger* pupils to direct their attention to those parts of the page which are of the most practical importance; and finally, because the Appendix is full of extremely useful directions, not to be found in other productions of this kind, and the knowledge of which may enable any one, in cases of sudden accidents, to relieve suffering and save life.

THEODORE P. DOGGETT,
Preceptor of Plymouth County Academy.

CHARLESTOWN, 30th JAN. 1846.

C. CUTTER, M. D.,

Dear Sir, — I have examined the Second Edition of your work on 'Anatomy and Physiology, for Schools and Families.' I am fully satisfied with it, and shall use it in my school.

It embraces the departments of Anatomy, Physiology and Hygiene, sufficiently minute and extensive for schools or general reading, and it cannot fail to find favor. The *practical* matter it contains greatly enhances its value. Its numerous engravings are well adapted to illustrate the text, and to interest the young learner in this most interesting study.

Very respectfully, your obedient servant,

SOULE CARTEE,
Principal of Boyleston Chapel School for Young Ladies.

ANDOVER, APRIL 14th, 1846.

CALVIN CUTTER, M. D.,

Dear Sir, — The interest which is beginning to be felt in the study of the human system, affords one of the most satisfactory indications that the cause of education is advancing. I have examined with care your work on 'Anatomy and Physiology,' and am highly pleased with its plan and execution. It is *plain, practical, and thorough*, and deserves to find a place among the standard text-books of our schools.

Yours very truly,

W. H. WELLS,
Principal of Phillips Academy, Andover, Mass.

COLLEGIATE INSTITUTE, ROCHESTER, DEC. 8th, 1845.

This is to certify, that I have examined a work entitled, 'Anatomy and Physiology, Designed for Schools and Academies. By Calvin Cutter, M. D.,' and that I consider it a very superior work of the kind. The manner in which the principles of the science are presented to the student, is such that he cannot fail to be deeply interested in the study. The correctness and care with which the numerous engravings have been executed, render this book one of great value to those teachers who desire to have their pupils *understand* what they study. It is with pleasure, therefore, that I recommend it to the patronage of the institutions for which it was designed.

N. W. BENEDICT,

Associate Principal and Prof. of Latin and Greek Languages.

I fully concur in the opinion of Prof. Benedict, as expressed above.

LEANDER WETHERELL,

*Principal of the English Department of the
Rochester Collegiate Institute.*

WARREN, FEB. 3d, 1846.

DR. CUTTER,

Dear Sir, — It gives us much pleasure to express to you our entire satisfaction with the text-book on Anatomy and Physiology, which you have prepared for schools. We have used it for the past six months in our school, and do not hesitate to say, that we consider it superior to any other book of the kind with which we are acquainted.

We are particularly pleased with the Chapters on the 'Skin and Digestive Organs.' The uses and abuses of these parts of the animal system are therein so clearly and forcibly presented to the mind of the student, that while he is becoming informed, he cannot but be materially benefited by their perusal. We shall henceforth make your work our standard text-book, in the place of Lee's, formerly used.

Yours respectfully,

J. P. GREEN, A. M.,

H. B. UNDERHILL, A. B.,

Associate Principals of Quaboag Seminary, Warren, Mass.

SWANZEY, N. H., MAY 1st, 1846.

CALVIN CUTTER, M. D.,

Dear Sir, — I have examined your late work on 'Anatomy and Physiology,' and take great pleasure in testifying my cordial approbation of it. Combining, as it does, the principles of *Anatomy* and *Physiology*, it supplies a want long felt by teachers and parents, which no other popular work fully meets. The numerous and well executed engravings afford a very good substitute for the Manikin, which is too expensive for most schools. The 'Practical Suggestions' are of incalculable value to all who wish to preserve soundness of body and mind.

We have introduced it into our Institution, and find it a valuable aid in the too much neglected study of the human system.

Yours truly,

JOHN S. LEE, A. B.

Principal of the Mt. Casar Seminary.

WILLISTON SEMINARY, EAST HAMPTON, FEB. 6th, 1846.

DR. CUTTER,

Dear Sir, — I thank you for your valuable work on 'Anatomy and Physiology, designed for Schools and Families.' I have examined it with great interest, and regard it as just the work to be introduced into our schools. It will be used as a text-book in this Seminary.

Accept the assurance that I am yours, very truly and respectfully,

S. WRIGHT.

YOUNG LADIES' INSTITUTE, PITTSFIELD, MARCH 12th, 1846.

C. CUTTER, M. D.,

Dear Sir, — I thank you for the copy of your work on Anatomy and Physiology. The thorough examination I have given it has afforded me much gratification; and I now take pleasure in recommending this work, as in my opinion decidedly better adapted to general use in schools than any other with which I am acquainted.

Yours truly,

W. H. TYLER.

BARRE HIGH SCHOOL, OCT. 8th, 1845.

CALVIN CUTTER, M. D.,

Dear Sir, — I have examined with care, your work on 'Anatomy and Physiology, designed for Schools and Families,' and am very favorably impressed both with its plan and execution. It contains much that is *practical* as well as instructive; and is recommended by its *brevity, clearness, and comprehensiveness*.

I think it preferable, as a text-book, to any other treatise upon the same subject now in use.

A. WELLINGTON,

Principal of the Barre High School.

DUXBURY, MAY 11th, 1846.

CALVIN CUTTER, M. D.,

Dear Sir, — I have given your work on Physiology a careful perusal. I have examined it with especial reference to its adaptation as a text-book for schools. It meets a want which I have for some time felt — the want of a book upon the subject of Physiology, which does not sedulously avoid accuracy of detail, and deal alone in loose generalities, but which seeks, by thorough descriptions, clear illustrations and useful hints, to afford pupils that kind of knowledge which will fit them to act understandingly for themselves and others in cases of emergency, as well as properly to regulate and provide for the daily wants of their systems. The superiority of the work over any yet introduced into our schools, is, in my mind, so evident, that I am disposed to think that it will be adopted by all those teachers who examine it for themselves — that the work will be its own best recommendation.

Very truly, yours, &c.,

JAMES RITCHIE,

Principal of Duxbury Academy.

J. P. L. Bingham
AUG 5 1897

